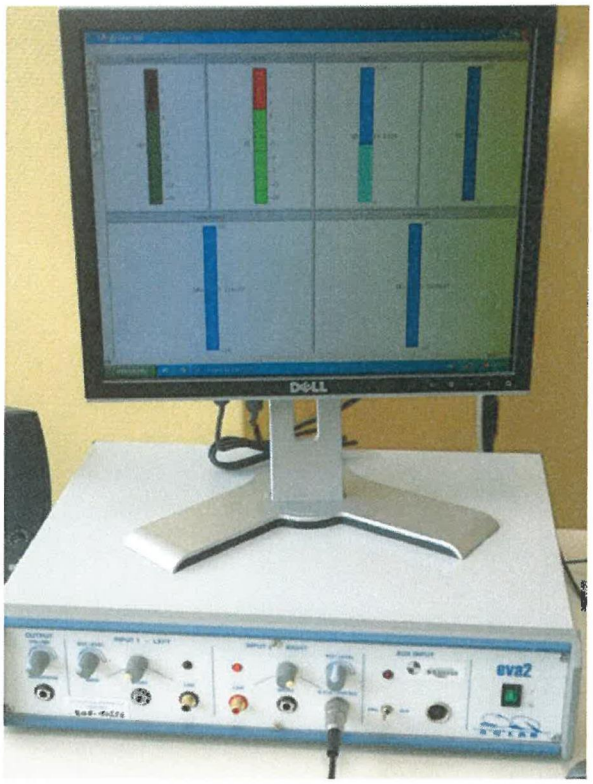
eva2

User Manual



SQLAB

SQLab © 2012

SESANE

Phonetogram

Spectrogram

Prosody

Voice Profile

Maximal Phonation Time

Realtime Feedback

Digital Tape

Glottal Efficiency

Spirometry

Nasality

E.G.G.

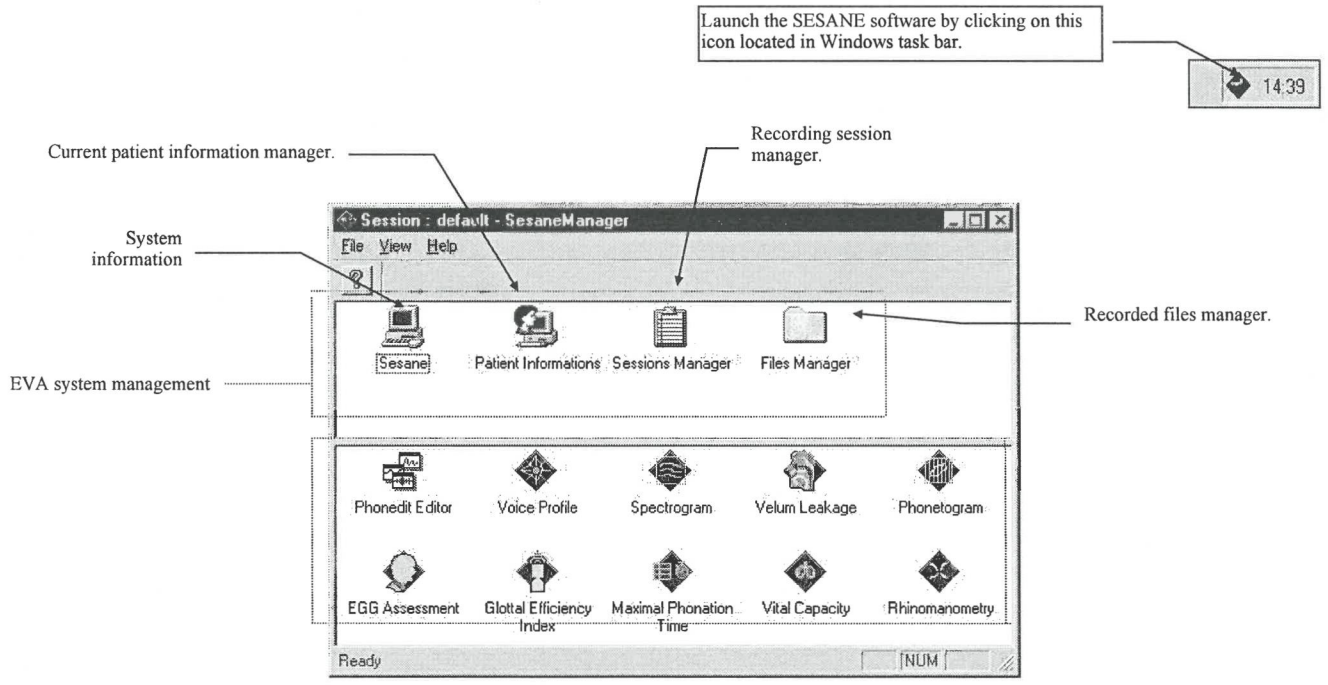
References

Installation / Maintenance

SESANE

To change SESANE settings, you must be logged as an ADMINISTRATOR (Windows NT, 2000, XP).

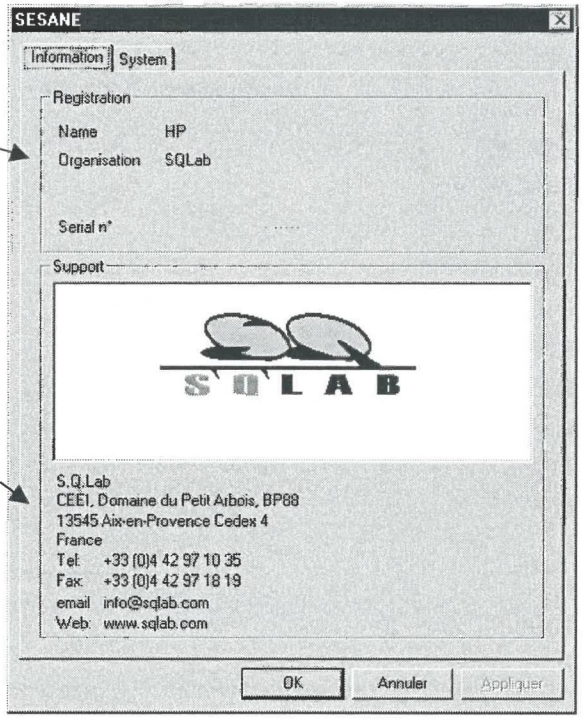
SESANE (Software Environment for Speech Analysis and Evaluation) is the operating software of the EVA 2 workstation.



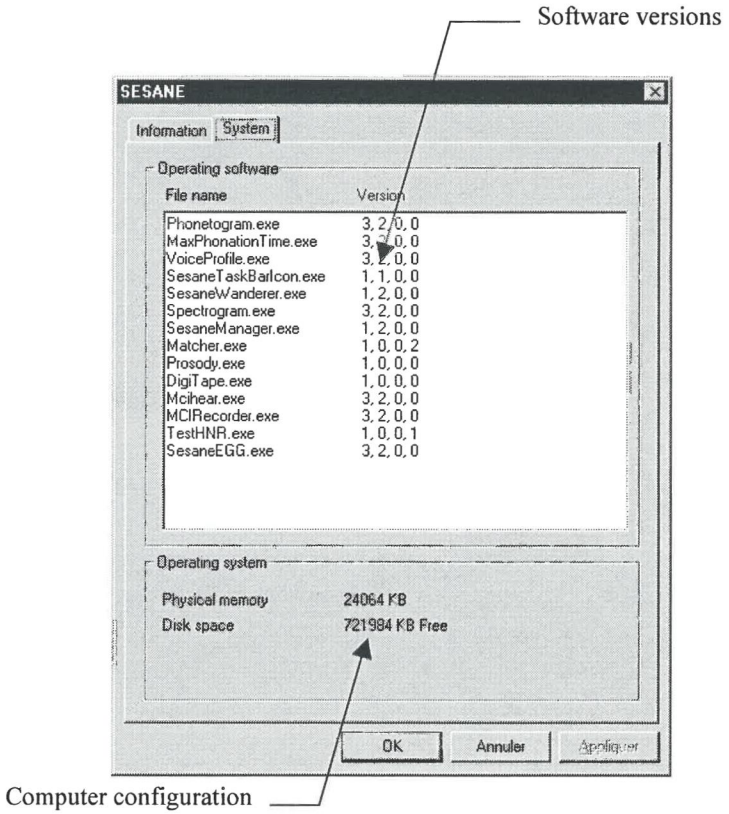
System manager

Allows to obtain information about the system and especially

- about support



- about the installation

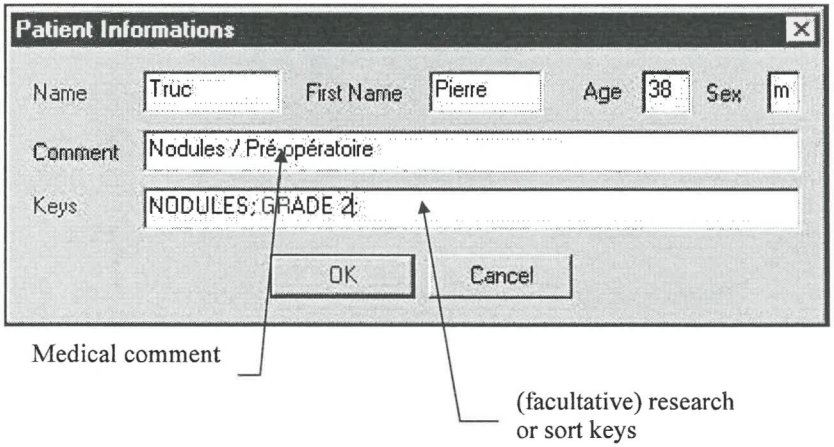


To obtain SESANE settings, you must be logged as an ADMINISTRATOR (Windows NT, 2000, XP).

Patients manager

Allows to record information relative to the patient about to pass the clinical tests.

It is strongly recommended to fill the form proposed because all the programs will use these information for the storage and the printing of the EVA documents.



Sessions Manager

This manager allows to customise the recorded data path. This is useful when :

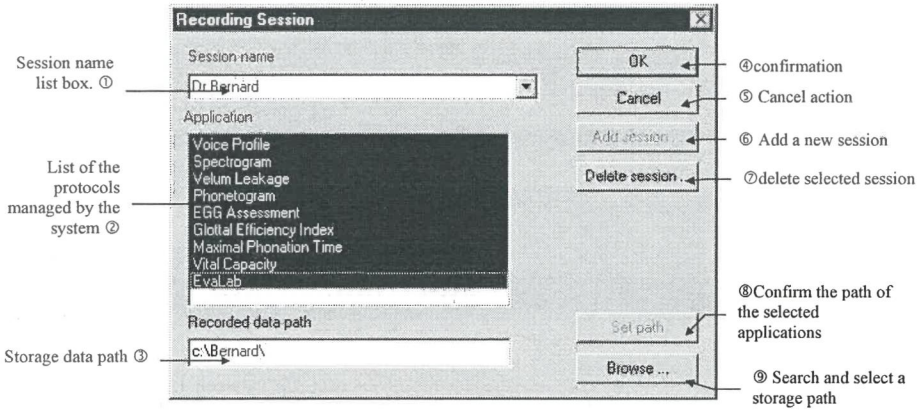
- Several users share the EVA workstation and wish to manage their data independently.
- In the case when different studies are carried on at the same time without mixing data

By definition, a *session* corresponds either to a user (ex : « Dr. Bernard »), either to a general study (ex : « Parkinson »).

To change SESANE settings, you must be logged as an ADMINISTRATOR (Windows NT, 2000, XP).

To use an existing session

Open the « session name » list box in ①
choose your session
click « OK »in ④
The selected session name appears in the title bar of the SESANE environment.



To create a new session

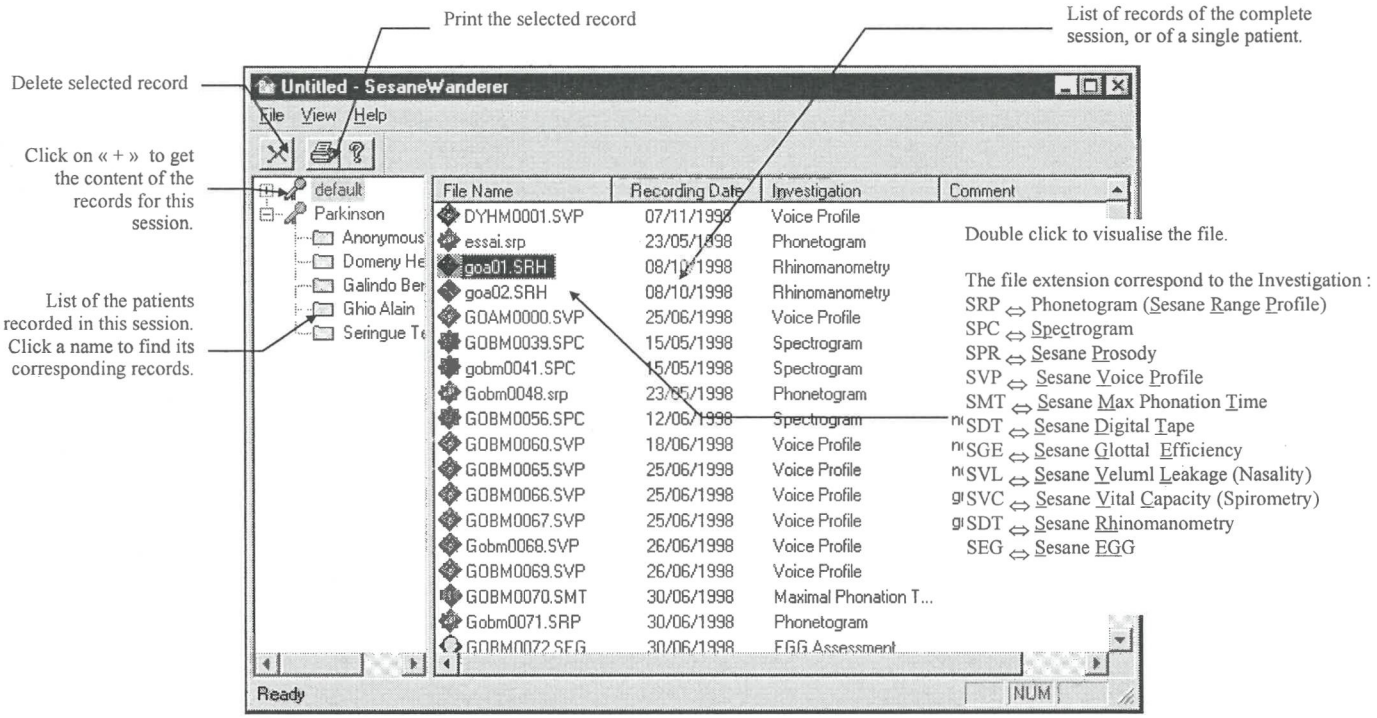
Select the field « Session name » in ①. Enter a name (ex : « Parkinson », « Laryngeal paralysis », « Dr. Bernard »...)
Click on « Add session » in ⑥
Activate and choose the session you wish to select in ①. Select one or more applications in the list box in ②
Enter the target path in « Recorded data path » in ③ and Validate this path by clicking on « Set Path » in ⑧.

To delete an existing session

Open the « session name » list box in ①
choose the session to delete
click on « delete session » in ⑦

Files Manager

This manager allows to sort and present the records created with EVA by session, by name, or in chronological order.


Print the selected record
List of records of the complete session, or of a single patient.
Delete selected record
Click on « + » to get the content of the records for this session.
List of the patients recorded in this session. Click a name to find its corresponding records.
Untitled - SesaneWanderer
File View Help
default
Parkinson
Anonymous
Domeny He
Galindo Ber
Ghio Alain
Seringue Te
File Name
Recording Date
Investigation
Comment
DYHM0001.SVP 07/11/1998 Voice Profile
essai.srp 23/05/1998 Phonetogram
goa01.SRH 08/10/1998 Rhinomanometry
goa02.SRH 08/10/1998 Rhinomanometry
GOAM0000.SVP 25/06/1998 Voice Profile
GOBM0039.SPC 15/05/1998 Spectrogram
gobm0041.SPC 15/05/1998 Spectrogram
Gobm0048.srp 23/05/1998 Phonetogram
GOBM0056.SPC 12/06/1998 Spectrogram
GOBM0060.SVP 18/06/1998 Voice Profile
GOBM0065.SVP 25/06/1998 Voice Profile
GOBM0066.SVP 25/06/1998 Voice Profile
GOBM0067.SVP 25/06/1998 Voice Profile
Gobm0068.SVP 26/06/1998 Voice Profile
GOBM0069.SVP 26/06/1998 Voice Profile
GOBM0070.SMT 30/06/1998 Maximal Phonation T...
Gobm0071.SRP 30/06/1998 Phonetogram
GOBM0072.SEG 30/06/1998 EGG Assessment
Ready
NUM
Double click to visualise the file.
The file extension correspond to the Investigation :
SRP ⇔ Phonetogram (Sesane Range Profile)
SPC ⇔ Spectrogram
SPR ⇔ Sesane Prosody
SVP ⇔ Sesane Voice Profile
SMT ⇔ Sesane Max Phonation Time
SDT ⇔ Sesane Digital Tape
SGE ⇔ Sesane Glottal Efficiency
SVL ⇔ Sesane Velumi Leakage (Nasality)
SVC ⇔ Sesane Vital Capacity (Spirometry)
SDT ⇔ Sesane Rhinomanometry
SEG ⇔ Sesane EGG

Investigation protocols

To start an investigation program select its icon in the main window of the SESANE environment.

Available programs depending on the system version :

		diana or eva2 acoustic	eva2 complete version
Software	Voice Profile	✓	✓
	Phonetogram	✓	✓
	Spectrogram	✓	✓
	Maximal Phonation Time	✓	✓
	Prosody	✓	✓
	Real time feedback	✓	✓
	Digital tape	✓	✓
	Spirometry		✓
	Nasality		✓
	Glottal efficiency		✓
	Rhinomanometry*		✓
	EGG*	✓	✓
Hardware			

* options

Phonetogram

The Phonetogram is a technique producing an evaluation of the vocal function in the form of an area made with the minimal and maximal intensities and notes emitted by a subject.

Principle

Practically, the subject must pronounce a /a/ at thirty centimeters from a microphone, first a mean note, at the lowest intensity possible, then at the loudest intensity. These intensities are displayed in the ordinate of a diagram where the notes are placed in abscissa. The process is repeated, note by note in descending order, until the lowest frequency the subject is able to produce. And then in ascending order until the highest frequency possible, whatever the timbre of the subject. With a professional singer, the experience is repeated with the /i/ and /u/ vowels. This Phonetogram meets the international standard[1], the scales are 40 to 110 dB for the intensity, and between 49 Hz to 1568 Hz in frequency.

Preparation

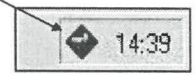
Equipment

Patient is standing up à 30 centimeters from the on-stand microphone. Verify carefully the distance with a ruler or a thread attached to the microphone.

Turn the selector **INPUT 1-LEFT** on **MICRO**.

Software

Launch the SESANE software by clicking this icon in Windows task bar.

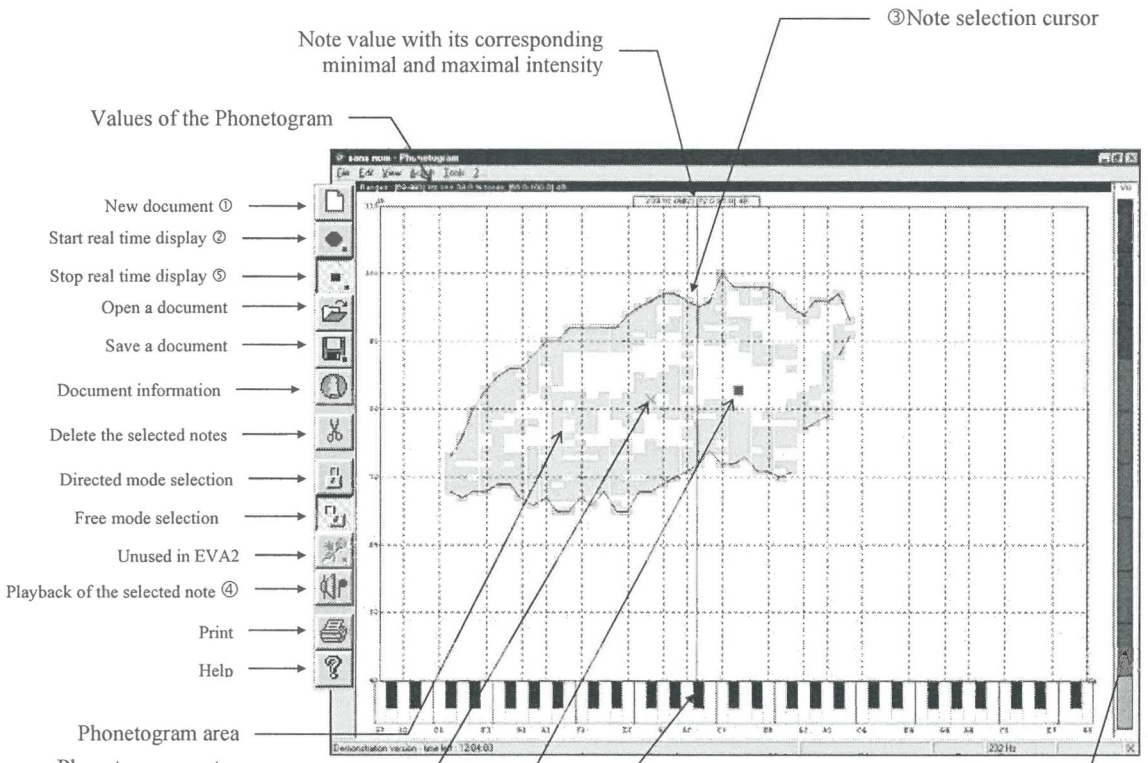


In SESANE, enter the patient information :

Double click on this icon :

[1] H.K.Schutte, W.Seidner, 1983, « Recommandations by the Union of European Phoniatricians (UEP) : Standardizing Voice Area measurements/Phonetography », Folia phoniat., 35 , 286-288

Using Phonetogram


③Note selection cursor
Note value with its corresponding minimal and maximal intensity
Values of the Phonetogram
New document ①
Start real time display ②
Stop real time display ⑤
Open a document
Save a document
Document information
Delete the selected notes
Directed mode selection
Free mode selection
Unused in EVA2
Playback of the selected note ④
Print
Help
Phonetogram area
Phonetogram centre
Current value in Hertz and Decibel, emitted by the subject.
Click on the piano to select and listen to the note
Verify at all time, that the sound input level does not reach +3 dB. If a saturation occurs, diminish the INPUT-1 LEFT volume

Protocol

① Create a new document if necessary
② Start real time display: *At this moment, all the notes emitted by the subject are displayed at screen in real time..*

In directed mode

③ Move the selection cursor at the position corresponding to the studied note. To do so, click on the cursor and move the mouse while maintaining its left button down.
④Listen to the selected note.
The patient reproduces the note. The detection of the note and the detection of the lowest and loudest intensity is automatic. The Phonetogram shape appears gradually.
Remark : **the shape appears after the second note tested.**
Repeat the operations in ③until the Phonetogram is completed.

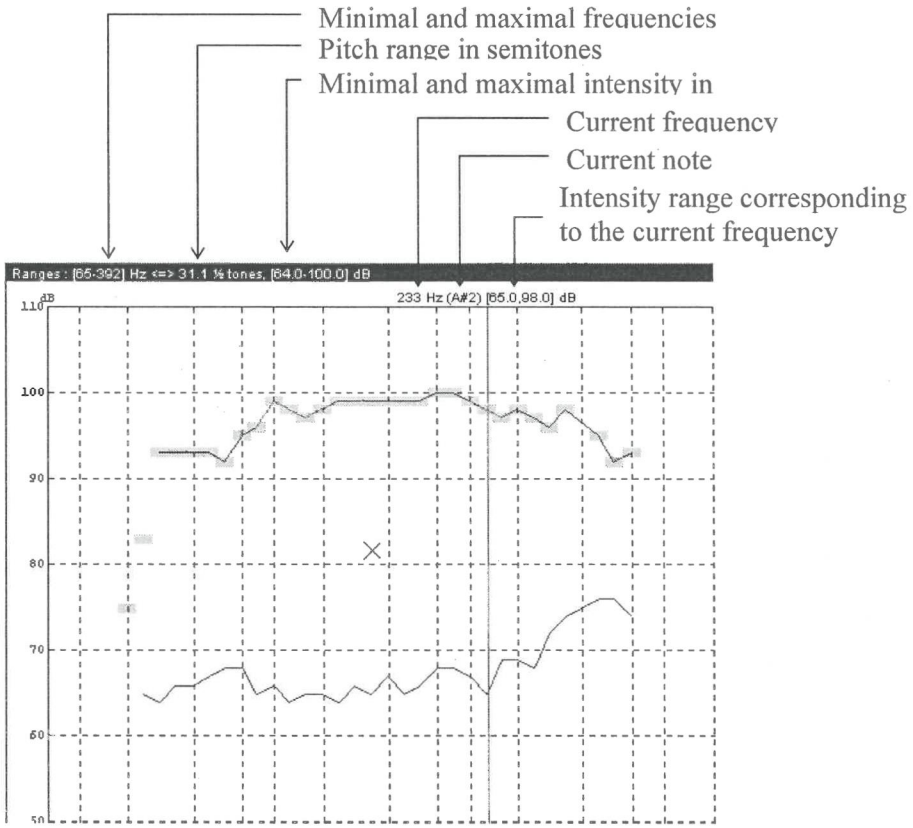
In free mode

The patient must sing in glissando, at different intensities. Each note produced is immediately validated and remains displayed at screen. This method is, of course, much faster.

⑤ Stop real time display.
Save the document.
Print the document.

Measurement

Measures

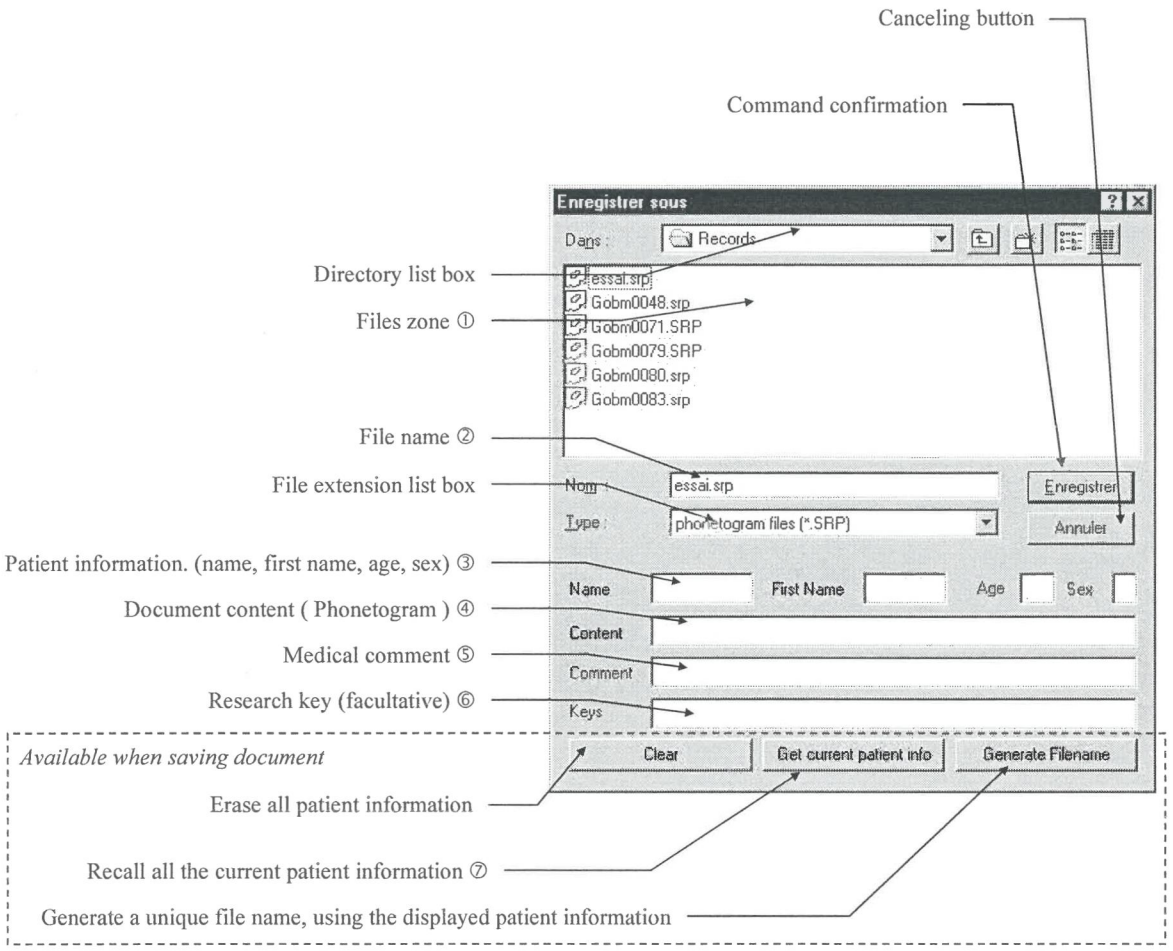


Editing Phonetogram

For deleting incorrect points :

1. Select a zone in the graph :
   - hold down the SHIFT key
   - move the mouse with the left mouse button down
2. To cut the selection :
   - Click the scissors icon ( )
   - or use the DELETE key
   - or use the menu Edit | Cut selected Frequencies

Data Management



Save a document

Method 1 : Click on ⑦. *The current patient information appear in the fields ③, ④, ⑤, ⑥. A unique filename is automatically generated in ②.* Confirm by clicking on ⑨.

Method 2 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Click on ⑧. *A unique filename appears in ②.* Confirm the saving by clicking on ⑨.

Method 3 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Enter a file name in ①. Confirm the saving by clicking on ⑨.

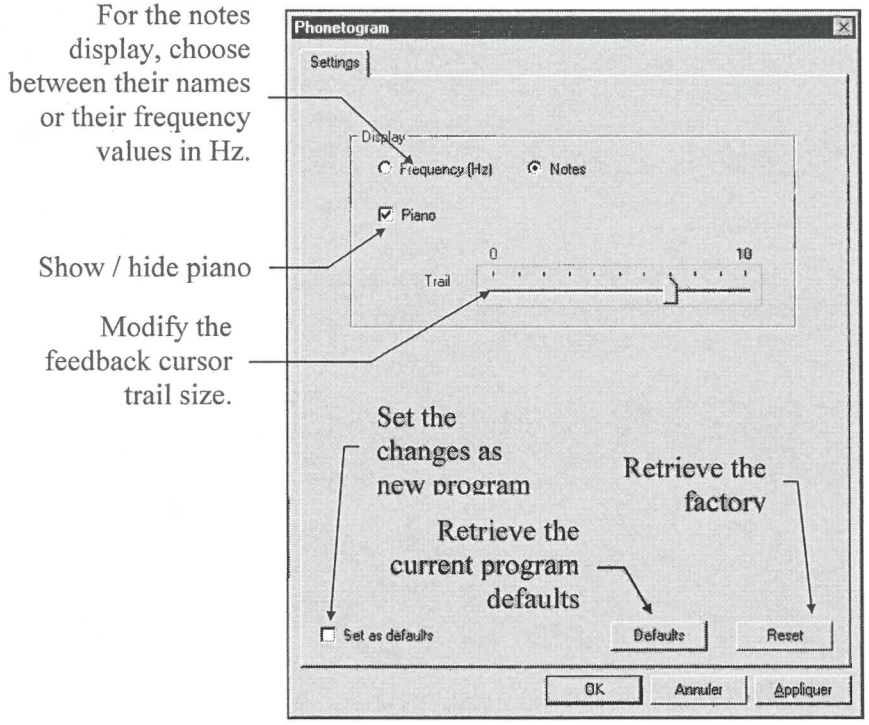
Open a document

Select a document in ① by a single click with the left mouse button.. *The file name appears in ② with its information as well in ③, ④, ⑤ ⑥.* Confirm your choice by clicking on ⑨.

To obtain information about the current document

Options

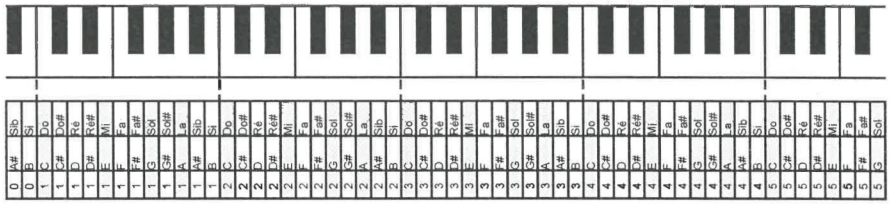
You can modify the program parameters by selecting the menu « Tools | Options » or by typing the « O » key.



Technical Notes

Generally it is not necessary to test all the notes of the scale. By convention, the notes Do, Mi, Sol have been chosen for the different octaves. They are signaled by dashed lines on the graph. (see the correspondence table below).
It is however possible to test each note of the scale if necessary. To do so, simply move slightly the selection cursor, until a change occurs in the frequency displayed on top of the cursor. Inversely, to shorten the exam length, the manipulator can choose to test only a few notes.

Correspondence table between notes (in semitone) and their frequencies



Memo :

- $Range\ (\text{in } ½ \text{ tones}) \approx 40.Log_{10}\left(\frac{Freq_1(Hz)}{Freq_2(Hz)}\right)$
- 1octave = 12 ½ tones

Spectrogram

Allows to visualize spectral variations of speech or voice according to time under a spectrographic representation.

Principle

The Spectrogram (or sonogram) allows to visualize the spectral variations of the speech signal versus time. The spectral analysis is realized with FFTs in wide or narrow bands. It is possible to choose at any instant of the Spectrogram the representation of spectral sections (frequency / amplitude) or to perform measures of signal versus noise ratio.

Preparation

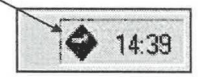
Equipment

Patient is standing up in front of the on-stand microphone.

Turn the selector **INPUT 1-LEFT** on **MICRO**.

Software

Launch the SESANE software by clicking this icon in Windows task bar.

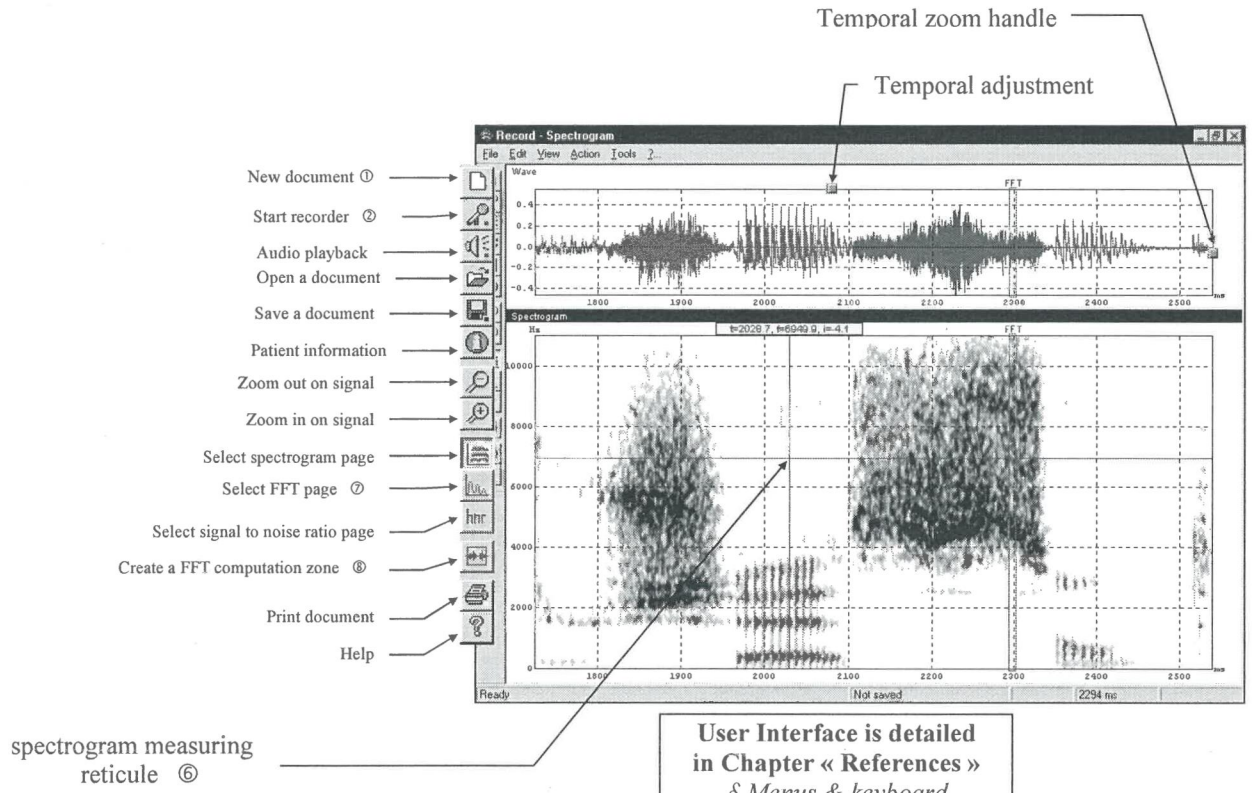


In SESANE, enter the patient information :

Then, click twice on this icon :

Using Spectrogram

Main window



User Interface is detailed in Chapter « References »
§ Menus & keyboard
§ Signal Manipulation

Protocol

① Create a new document if necessary

② Start real time display.

The recording control window appears.

Patient makes a try.

③Verify the recording level of the acoustic input vu-meter. Beware of not reaching +3 dB while recording. If necessary, adjust the volume button of INPUT 1-LEFT. A low signal may indicate a bad position of the selector MASK - MICRO - LINE.

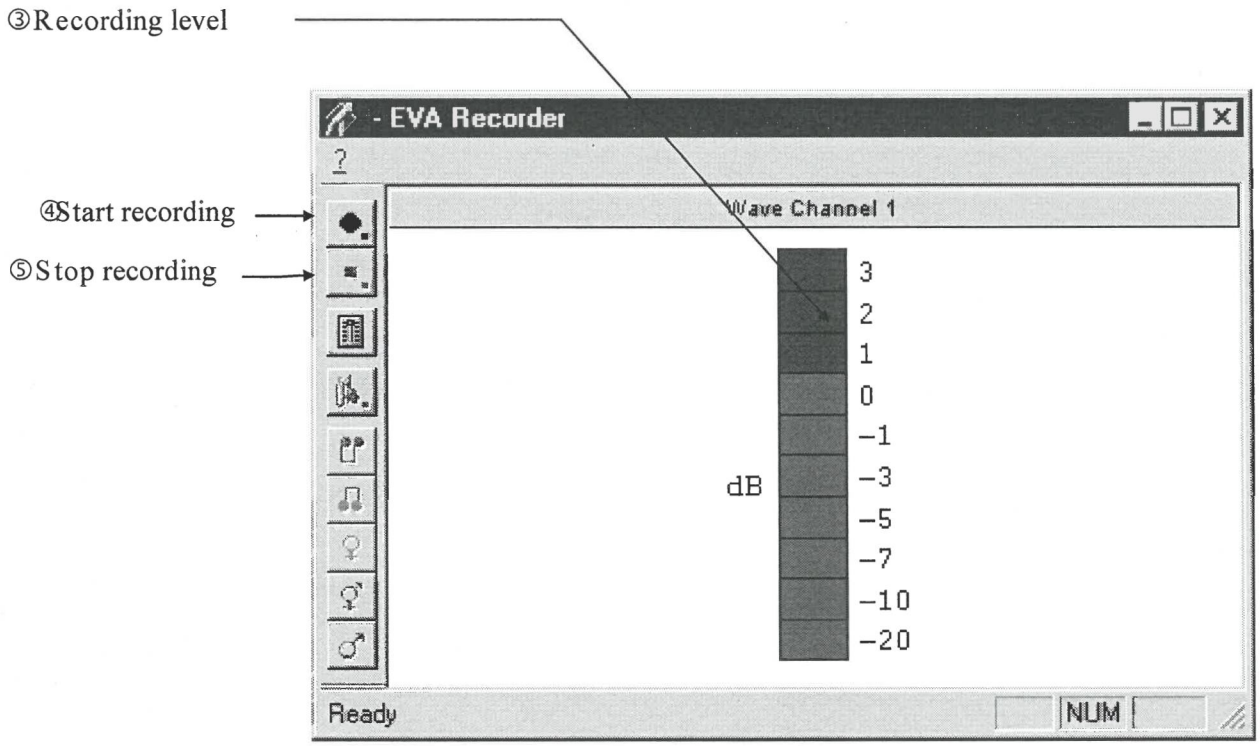
④ Start recording.

The patient produces its sentence.

⑤ Stop recording.

The main window appears again..

Recording control window



Depending on the needs :

⑥ Take measures on Phonetogram by clicking the left mouse button. A measure reticule appears, displaying the pointed values in ms, Hz, and dB.

Or :

⑦ Display the FFT page and

⑧ Create a FFT computation zone. This one can be moved along the speech signal.

Save the document.

Print..

Measurement

Spectrogram page

The spectrogram settings can be changed by calling its properties (right mouse button).

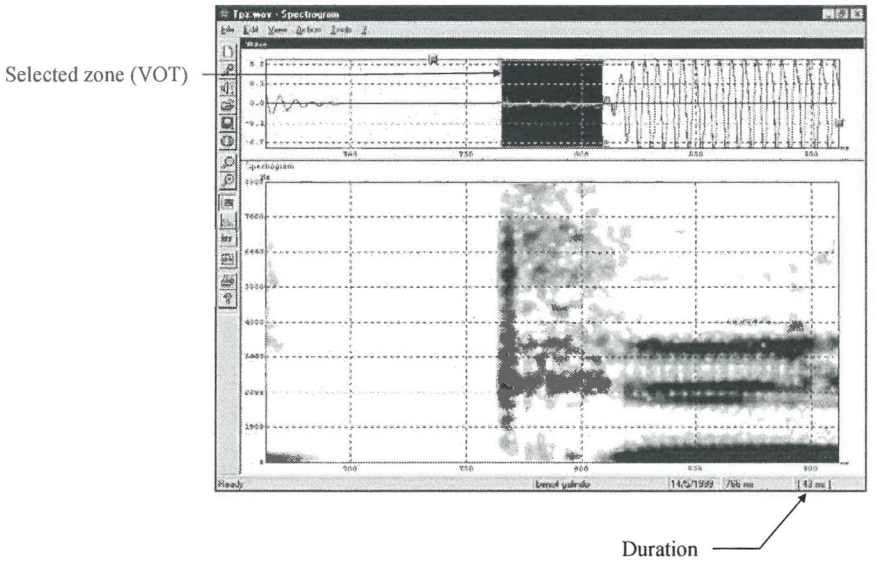
In a general point of view, you can take measures on Spectrogram by clicking the left mouse button. A measure reticule appears, displaying the pointed values in ms, Hz, and dB ⑥.

The spectrogram is a tool made for measuring duration of phonetic segments (ex : formants transition, phoneme duration, Voice Onset Time...). In such a case, it is better to use a wide band spectrogram.

To measure duration, select a zone using wave signal and spectrogram. The duration selected is displayed directly in the status bar. To select a zone :

1. place the mouse pointer at the beginning,
2. press and hold down the Shift key + left mouse button,
3. move the mouse until the end
4. release

ex : Voice Onset Time (VOT) measurement



FFT page

The FFT page displays the wave spectrum around a frame called computation zone ®.

To move this zone :

1. place the mouse pointer near the left side of the zone
2. press and hold down the left mouse button,
3. move the mouse
4. release

To change the zone duration, call spectrum properties (right mouse button).

To take measures on the spectrum :

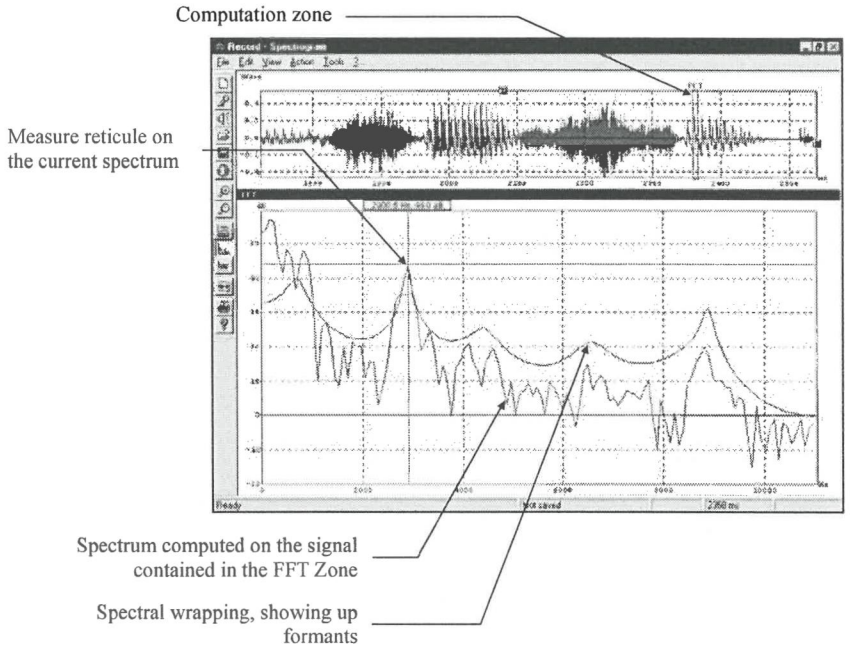
1. place the mouse pointer on the spectrum
2. click the left mouse button.
3. a reticule appears, displaying the pointed values in Hz, and dB.

To measure formants position :

1. Set the spectrum in wide band (cf. Properties)
2. Use the LPC spectrum which displays spectral peaks
3. Maybe you should erase F0 effect by checking the pre-emphasis option (cf. Properties)

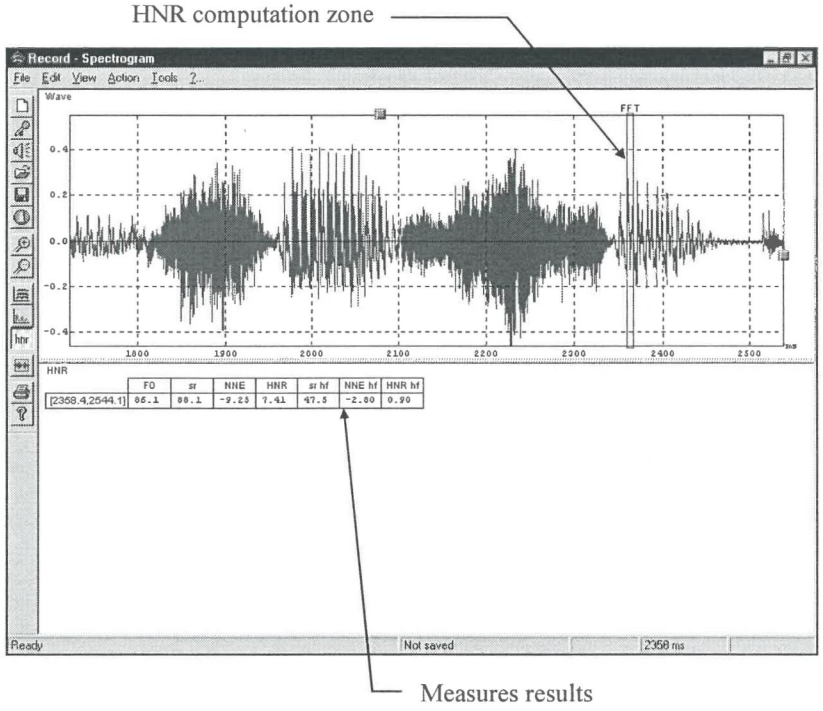
To display harmonic structure :

1. Set the spectrum in narrow band (cf. Properties)
2. Use the FFT spectrum which displays F0 and harmonics
3. Maybe you should rise spectral resolution if necessary (cf. Properties)


Computation zone
Measure reticule on the current spectrum
Spectrum computed on the signal contained in the FFT Zone
Spectral wrapping, showing up formants

HNR page

The HNR page displays the harmonic to noise ratio around a frame called computation zone ⑧.



To move this zone :

1. place the mouse pointer near the left side of the zone
2. press and hold down the left mouse button,
3. move the mouse
4. release

To change the zone duration, call spectrum properties (right mouse button).

Generally, this frame must be long enough to provide sufficient information on F0 and short enough to avoid an analysis of a non stable wave (typically : 250 ms)

This analysis is performed with spectral methods. We consider that the speech signal is made up of two components :

- a periodic component (F0 & harmonics)
- a noise component (the rest)

the mathematical sum of theses two components is considered as the full signal.

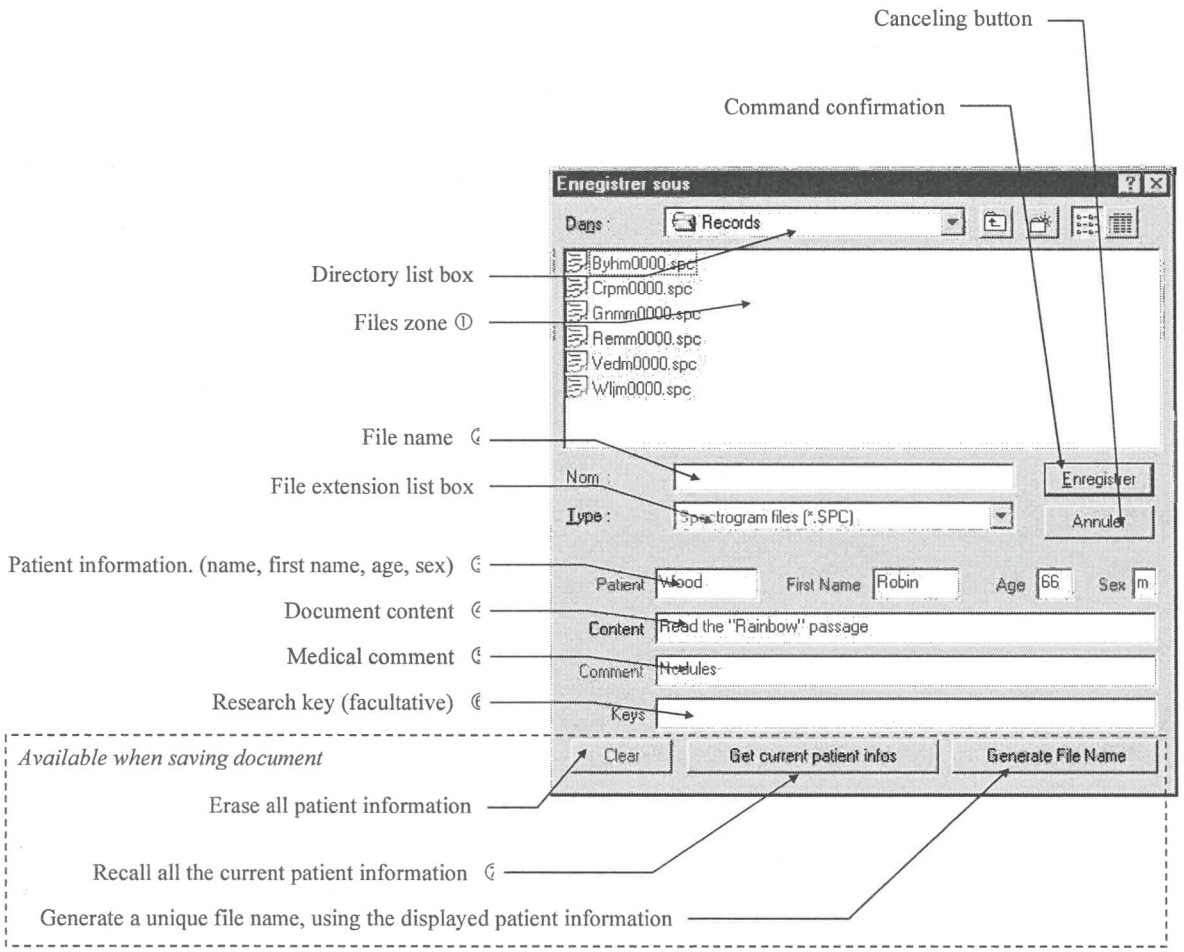
The measures are given under redundant forms :

SR	(%)	Relative Signal Intensity = Energy (*F0* + *Hi*) / Total energy
H/N	(no unit)	Harmonic-to-noise Ratio = Energy(*F0* + *Hi*) / Energy(noise)
NNE	(dB)	Normalized Noise Energy = 10. Log [Energy(noise) / Total Energy]

The first values (SR, H/N, NNE) are computed on the whole spectrum.
The second values (SR hf, H/N hf, NNE hf) are computed one the spectrum part above 1 kHz.

Rem : this method is different than the one used in the Voice Profile Application

Data Management



Save a document

Method 1 : Click on ⑦. *The current patient information appear in the fields ③, ④, ⑤, ⑥. A unique filename is automatically generated in ②.* Confirm by clicking on ⑨.

Method 2 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Click on ⑧. *A unique filename appears in ②.* Confirm the saving by clicking on ⑨.

Method 3 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Enter a file name in ①. Confirm the saving by clicking on ⑨.

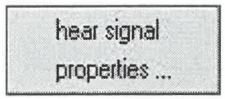
Open a document

Select a document in ① by a single click with the left mouse button.. *The file name appears in ② with its information as well in ③, ④, ⑤ ⑥.* Confirm your choice by clicking on ⑨.

To obtain information about the current document

Options

By clicking on the spectrogram with the right mouse button, a contextual menu appears.



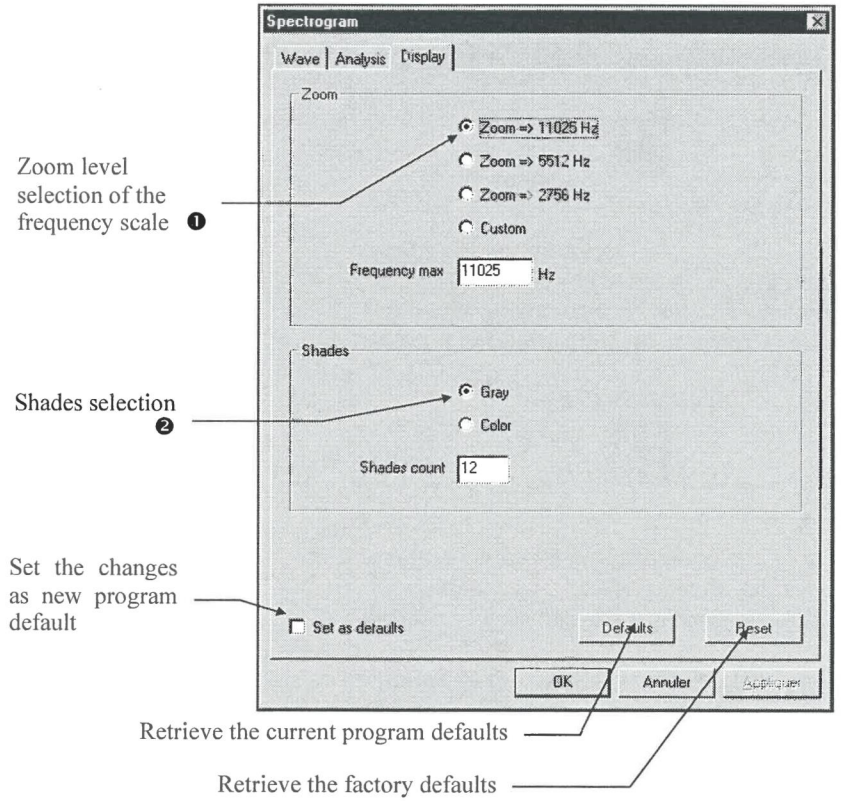
Choose the « properties » option.

You can also modify the program parameters by selecting the menu « Tools | Options » or by typing the « O » key.

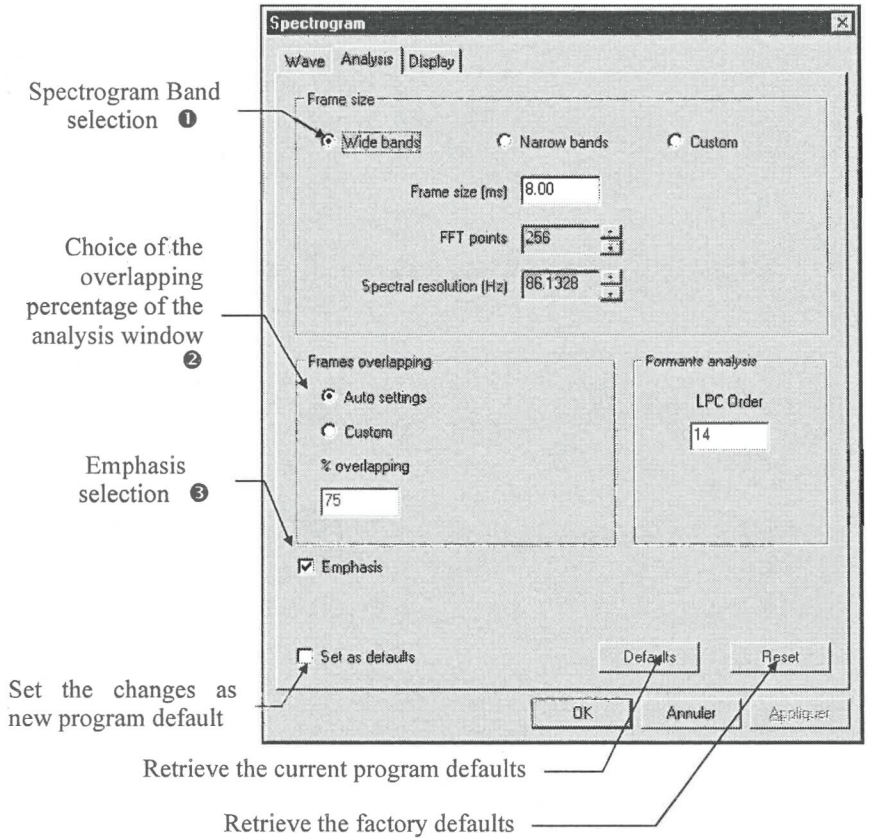
Setting the display

❶ The « zoom » option allows to select the displaying of a part of the spectrum. This option is useful to observe the formants generally localised in the low part of the spectrum.

❷ « shades » allows to choose between a grey or colour display



Analysis settings

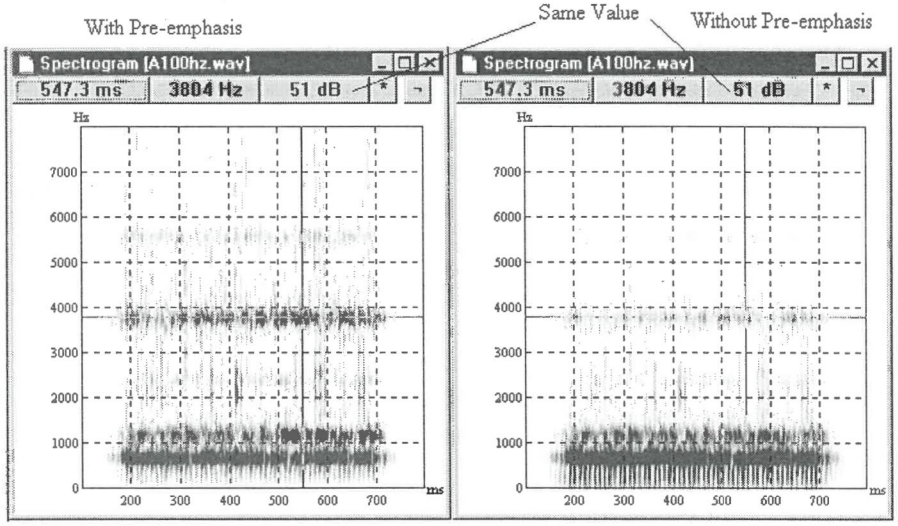


❶ You can select a Wide Band spectrum, a Narrow Band one or you can fix your own parameters. It is useful to know that the Narrow Band analysis uses long windows. So, it gives you a poor temporal precision but a great quality for frequency measure (ex : harmonics). On the other hand, Wide Band analysis uses short windows. So, it gives you a good temporal precision but a medium quality for frequency measure (ex : formants).

For a FFT spectrum, the most important parameter is the length of the analysis window. You can set this length by writing the value in the " Window Size (ms) " text edit. The value must be in milliseconds (1 second = 1000 ms). Do not forget that the longer the window is, the more the frequency analysis is precise. In the other hand, the shorter the window is, the more the temporal analysis is precise.

❷ A spectrogram is built using successive spectra. Each spectrum is computed on a signal window. This window is shifted along the signal. This operation is called « window step ». You can let the algorithm fix automatically this parameter. If you want a precise value, just set the overlapping percent in the text edit. Window step is equal to :
*step(ms) = window size(ms) * (1 - percent/100)*

❸ Generally, spectral distribution of a speech signal has a 6 or 12 dB/Oct slope. That means that acute frequencies are lower than bass. The consequence is that you cannot see them on a spectrogram. Ticking « High-Frequencies emphasis » allows to roll up the acute. This option does not change the values that you can read with reticule.



Prosody

The aim of this application is the objective assessment of prosodic disorders, particularly in case of neurological troubles (ex: Parkinsonians)
It is also useful to assess the speech expressivity (ex : laryngectomised)

Principle

1. The subject is recorded in spontaneous condition or reading sentences, text...
2. Four windows are displayed corresponding to the sound, the melody, the intensity (dB) and the pause detection
3. It is possible to study :
   - melodic patterns
   - intensity patterns
   - utterance duration / syllabic rate
   - pause placement along the discourse

Preparation

Equipment

1. Plug the microphone in the INPUT 1-LEFT
2. Place the patient at 30 cm from the on stand microphone.
3. Ensure yourself that he does not move

Software

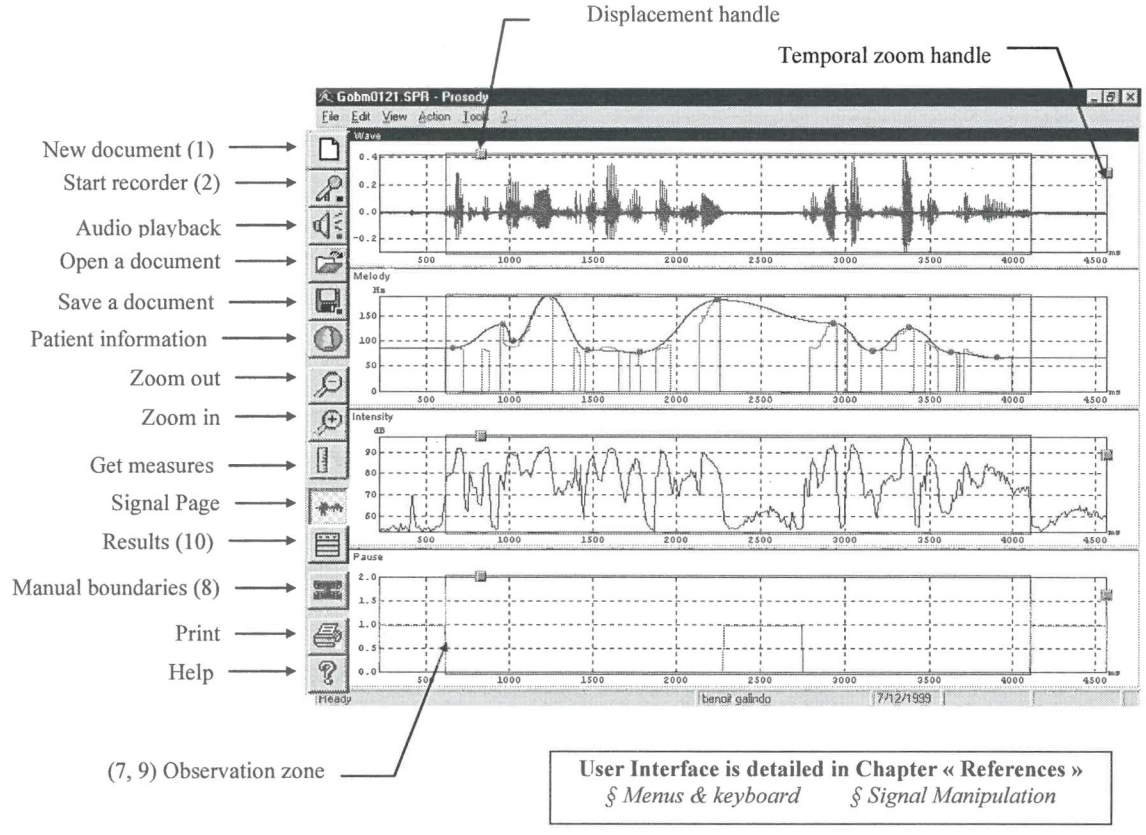
Launch the SESANE software by clicking this icon in Windows task bar.

In SESANE, enter the patient information :

Then double click on this icon :

Using Prosody

Main Window



User Interface is detailed in Chapter « References »
§ Menus & keyboard *§ Signal Manipulation*

Protocol

(1) Create a new document if necessary

(2) Start the recorder.

The recording control window appears.

Wait 3 seconds before speaking

Patient can speak to test the level.

(3) Verify the recording level of the acoustic input vu-meter. Beware of not reaching +3 dB while recording. If necessary, adjust the volume button of INPUT 1-LEFT.

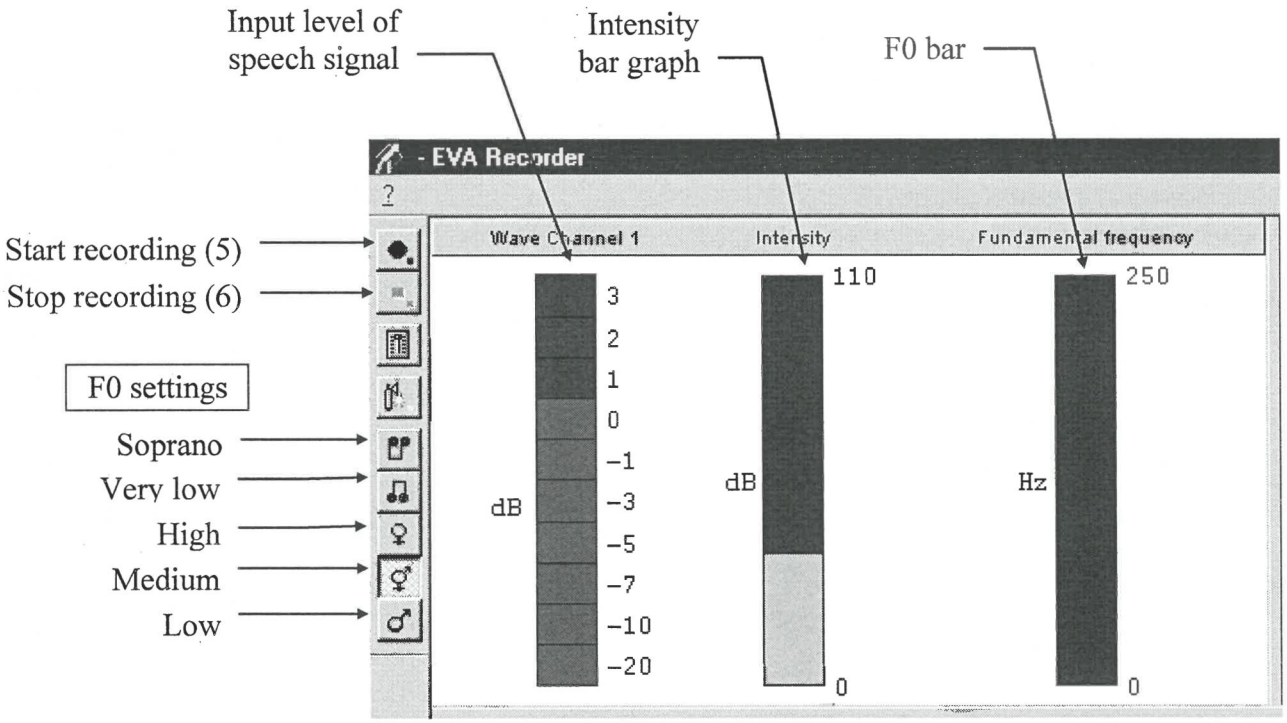
(4) Set up the register of fundamental frequency depending on the patient tessitura.

(5) Start recording. The patient produces its utterance.

(6) Stop recording.

The main window appears

Recording control window



(7) The observation zone appears automatically if a silent is present at the beginning and at the end.

(8) You can also set manually the boundaries. To do that,

- select a zone (place the mouse pointer at the beginning, press and hold down the Shift key + left mouse button, move the mouse until the end and release
- press the icon (9)

(9) You can move this zone if necessary.
To move,

- place the mouse pointer near the cursor
- click and hold down the left mouse button
- move the mouse where you want
- release the left button.

(10) The results appear in the result page.

You can create again an automatic observation zone by selecting the *Automatic boundaries* in the *Action* Menu.

Save the document.

Print the document.

Measurement

Prosody assessment is performed on an observation zone chosen on the recorded signal.

Observation zone creation

The observation zone appears automatically if a silent is present at the beginning and at the end of the utterance. This zone starts at the end of the initial silence and finishes at the beginning of the final silence.

You can also define manually this zone. All the analysis will be computed again.

To define manually a zone :

1. select a part of signal (place the mouse pointer at the beginning, press and hold down the Shift key + left mouse button, move the mouse until the end and release).
   You can control the length of your selection by watching in the status bar.

2. click on the icon of zone transformation :
   or select the menu « *Action* | *Manual Selection* »
   or use the keyboard accelerator « S »

The analysis zone is enlarged to the size of the selected zone, and the statistics are immediately performed.

To define automatically the observation zone :
   select the menu « *Action* | *Automatic Boundaries*»
   or use the keyboard accelerator « A »

Observation zone placement

To move the observation zone :
1. place the mouse pointer near the left edge of the zone cursor,
2. click the left mouse button and maintain it down,
3. move the analysis zone,
4. release

Results display

Results are displayed in statistics page which contains numerical and graphical results. To switch between these pages use these icons :

Statistics : Signal

You can also change the current page by
- selecting the menu « View | Switch to xxx page »
- OR by using the keyboard accelerators « 1 », « 2 »

Melody

The program displays statistics and graphics about melody. The analysis is computed on the observation zone using the modelled melody (cf. Technical note, p.10). Only data out of a silent pause are processed.

Numerical results :

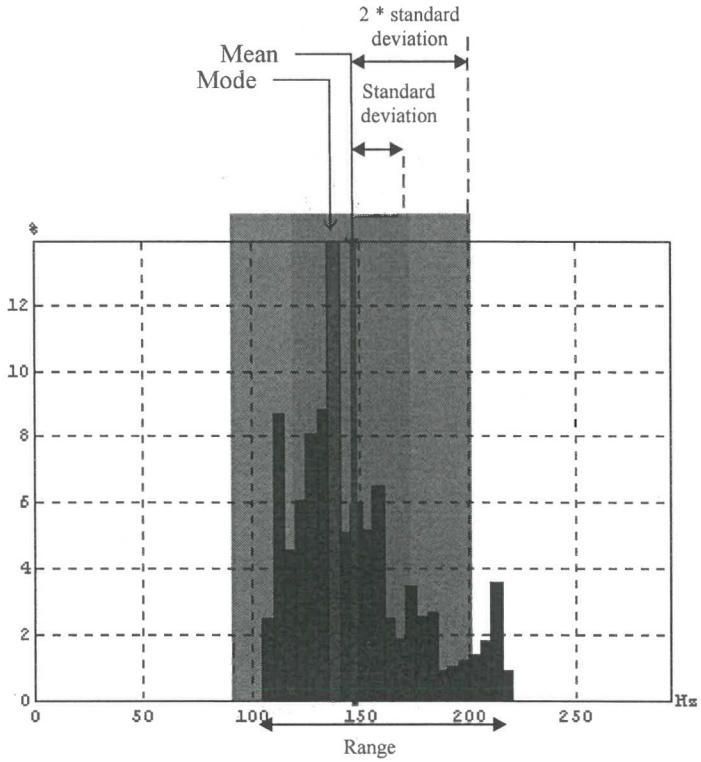
In general, mean and mode provide information about « usual » pitch.
Standard deviation, coefficient of variation and range provide information about melodic dynamic.

These values are very dependent of the phonetic material : text, spontaneous speech, sentence...

	Frequency	½ tones
Mean	146.6 Hz	D2
Mode	[135.0 140.0] Hz	C#2
Std dev	27.7 Hz	3.0
Coeff. of variation	18.9 %	-
Min	109.9 Hz	A1
Max	215.7 Hz	A2
Range	105.8 Hz	11.7

+

Distribution :



A reticule is available to take measure (just click on the distribution graph and move the mouse holding down the left mouse button) .

Intensity

The program displays statistics and graphics about intenisty. The analysis is computed on the observation zone. Only data out of a silent pause are processed.

Numerical results :

In general, mean and mode provide information about « usual » intensity.
Standard deviation, coefficient of variation and range provide information about intensity dynamic.

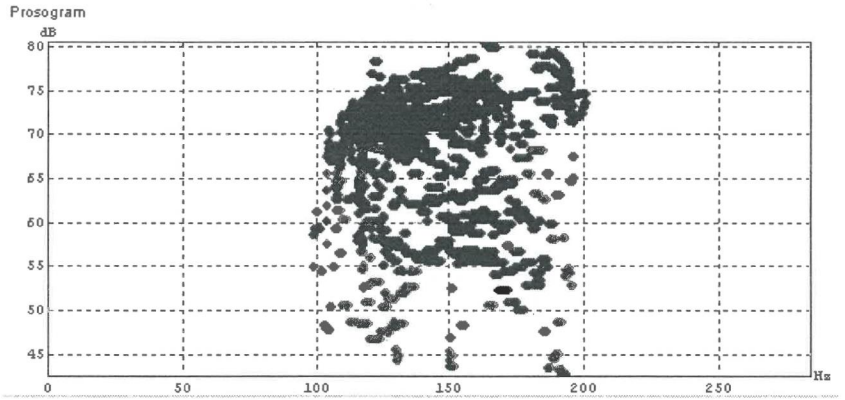
These values are very dependent of the phonetic material : text, spontaneous speech, sentence...

Intensity

Analysis zone [0.4 ; 9.0 s]	Parts without silence
Mean	67.2 dB
Mode	[70.0 75.0] dB
Std dev	7.9 dB
Min	42.6 dB
Max	80.7 dB
Range	38.1 dB

Prosogram

The prosograph is a frequency/intensity display. It is the same view as a phonetogram on running speech recorded with the prosody application.



Pauses

The program displays statistics and graphics about silent pauses. The analysis is computed on the observation zone using the pause detection (cf. Technical note, p.10).

Numerical results :

Only silent pauses are detected. We call signal the non silent parts of the sound wave.

	Pause	Signal	Total
Duration (sec.)	3.233	9.927	13.160
%	24.6 %	75.4 %	100 %
Nb.	7	8	15
Mean duration (sec.)	0.462	1.241	0.877

Cumulated duration

Ratios

Counting

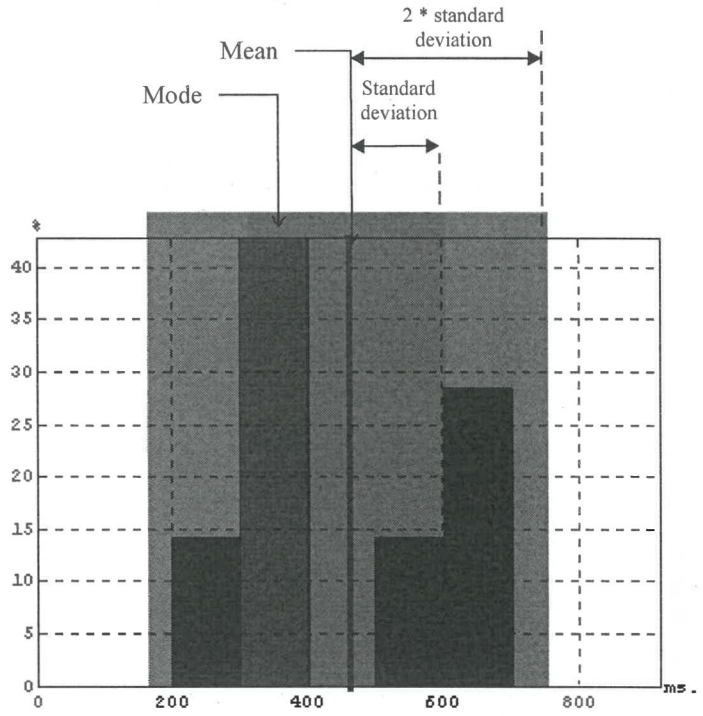
Mean = Cumulated duration / Nb

Explanation

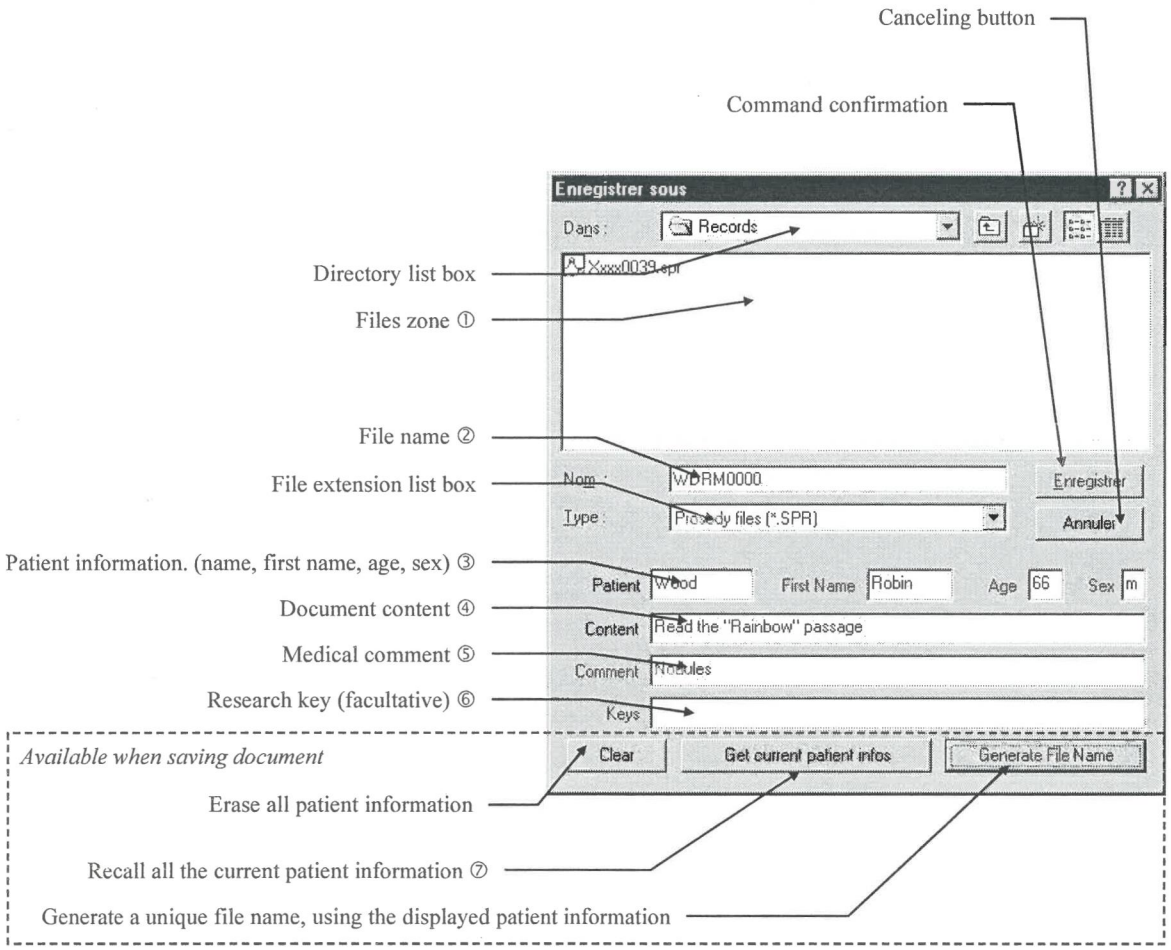
The patient has spoken during 13,16 ms. During this time, 7 pauses were performed. All these pauses account for 24.6% of the time.

Distribution :

The pauses distribution provides information about individual pause duration.



Data Management



Save a document

Method 1 : Click on ⑦. *The current patient information appear in the fields ③, ④, ⑤, ⑥. A unique filename is automatically generated in ②.* Confirm by clicking on ⑨.

Method 2 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Click on ⑧. *A unique filename appears in ②.* Confirm the saving by clicking on ⑨.

Method 3 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Enter a file name in ①. Confirm the saving by clicking on ⑨.

Open a document

Select a document in ① by a single click with the left mouse button.. *The file name appears in ② with its information as well in ③, ④, ⑤ ⑥.* Confirm your choice by clicking on ⑨.

To obtain information about the current document

Options

You can modify the program parameters by selecting the menu « Tools | Options » or by typing the « O » key. You can also use « Properties » object menu (right mouse button).

The specific options of this application are following.

Pauses detection

Pause detection is based on silence analysis. The energy is computed on successive frames whose length is called *Integration Time*. According to theses energies measured, the algorithm distinguishes low energy frames (silence) and high energy frames (signal). Different parameters can set this automatic algorithm.

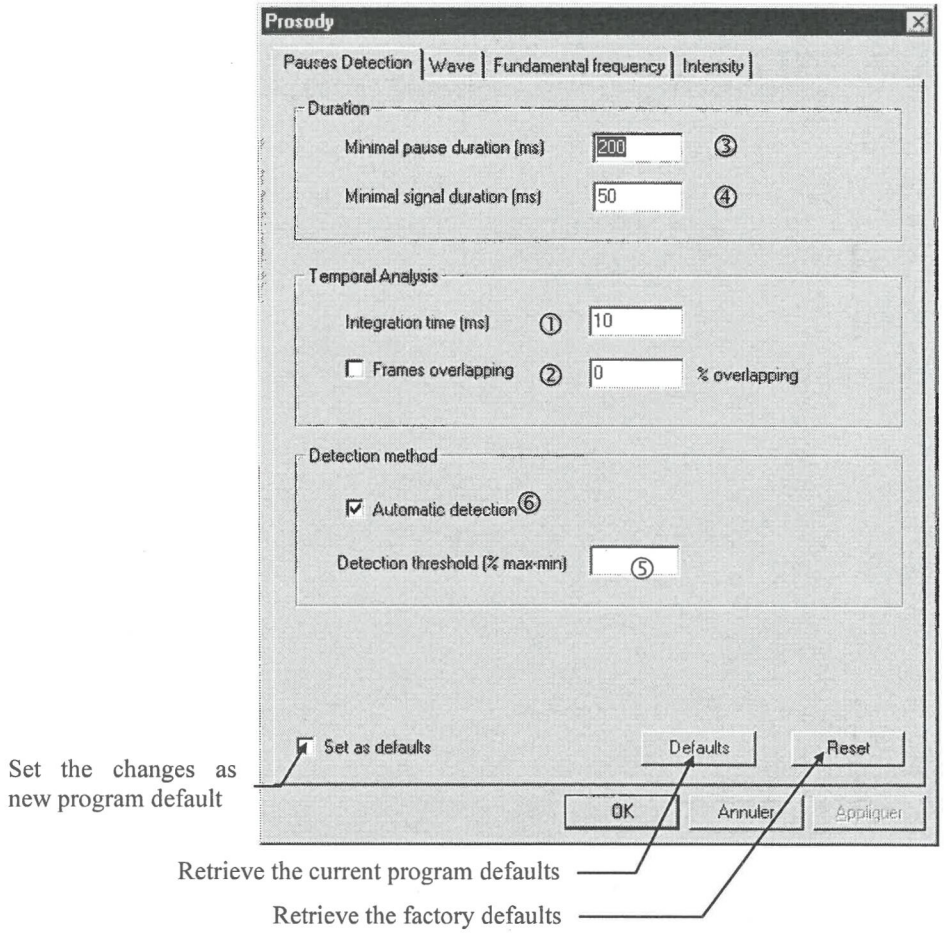
① *Integration time* (in ms) is the length of the analysis frame. 10 ms is a typical value which is long enough to smooth very quick events an which is short enough to obtain a satisfactory grain.

② The energy analysis is performed on successive frames. These frames can be completely placed side by side or can be overlapped. The *overlapping* parameter is available to set this computation. The 0 value means that the frames are placed side by side.

③ *Minimum pause duration* (in ms) is necessary to avoid that the algorithm considers as a pause a short silence as, for example, in the case of unvoiced plosives (a short silence appears between /o/ and /t/ in the word « potatoes »)

④ *Minimum signal duration* (in ms) is necessary to avoid that the algorithm considers as signal a short noise.

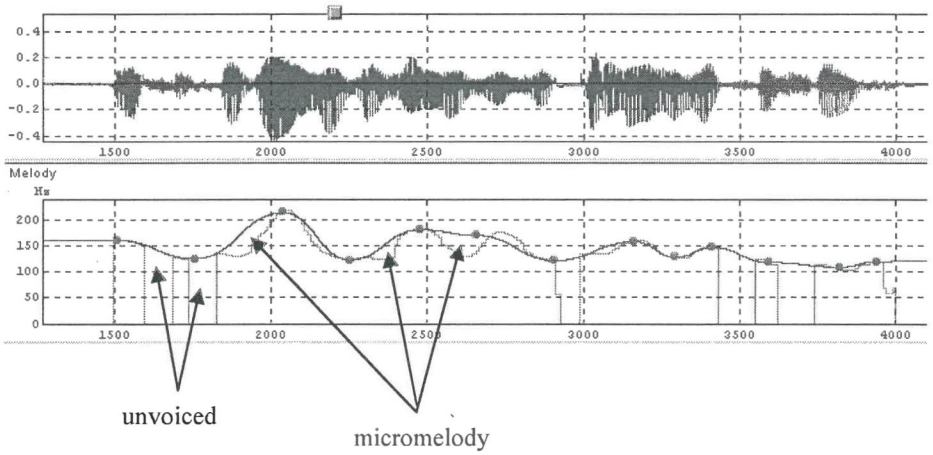
⑤ *Detection Threshold* (in %) is the value where all analysis frames greater than this threshold are considered as signal. If you increase this threshold, some parts of the sound wave will be detected as silences. If you want to let the algorithm computing automatically this threshold, click on *Automatic Detection* ⑥ .



Technical note

Modelled Melody

The modelled melody is computed with the MOMEL method*. These targets correspond to relevant local variations of melody. They are linked by a quadratic spline interpolation function. They are useful to retrieve the suprasegmental pattern where all the micromelodic variations or unvoiced segments are not taken into account.



The analysis is computed on the observation zone using the modelled melody. Only data out of a silent pause are processed.

* Hirst D.J. & Espesser R. (1993), « Automatic modelling of fundamental frequency using a quadratic spline function ». Travaux de l'Institut de Phonétique d'Aix, vol.15, 71-85

Voice Profile

The aim of this protocol is to objectify assessment of dysphonia and to help to the follow-up of vocal pathologies.

Principle

The subject pronounce a sustain « a » during a few seconds at usual intensity and pitch. The manipulator places an analysis zone on the most stable part of the signal. The program extracts from this observation zone indexes of voice quality like :

- mean, standard deviation, variation coefficient of F0, intensity and oral airflow.
- instability of vibration frequency : mean jitter , jitter factor, jitter ratio, Relative Average Perturbation (RAP)
- instability of vibration in amplitude : shimmer , Amplitude Perturbation Quotient, Shimmer factor
- signal/noise ratio
- glottic leakage index (explores presence or absence of « air leakage » through the glottis)

Preparation

Equipment

[EVA AERODYNAMIC]	[EVA ACOUSTIC]
Place a disinfected mask on the mouthpiece. Choose a mask that will fit well with the patient face.	Place the patient at 30 cm from the on stand microphone. Ensure yourself that he does not move. Plug the microphone jack in the INPUT 1-LEFT input.
Turn the selector INPUT 1-LEFT on MASK.	Turn the selector INPUT 1-LEFT on MICRO.

Software

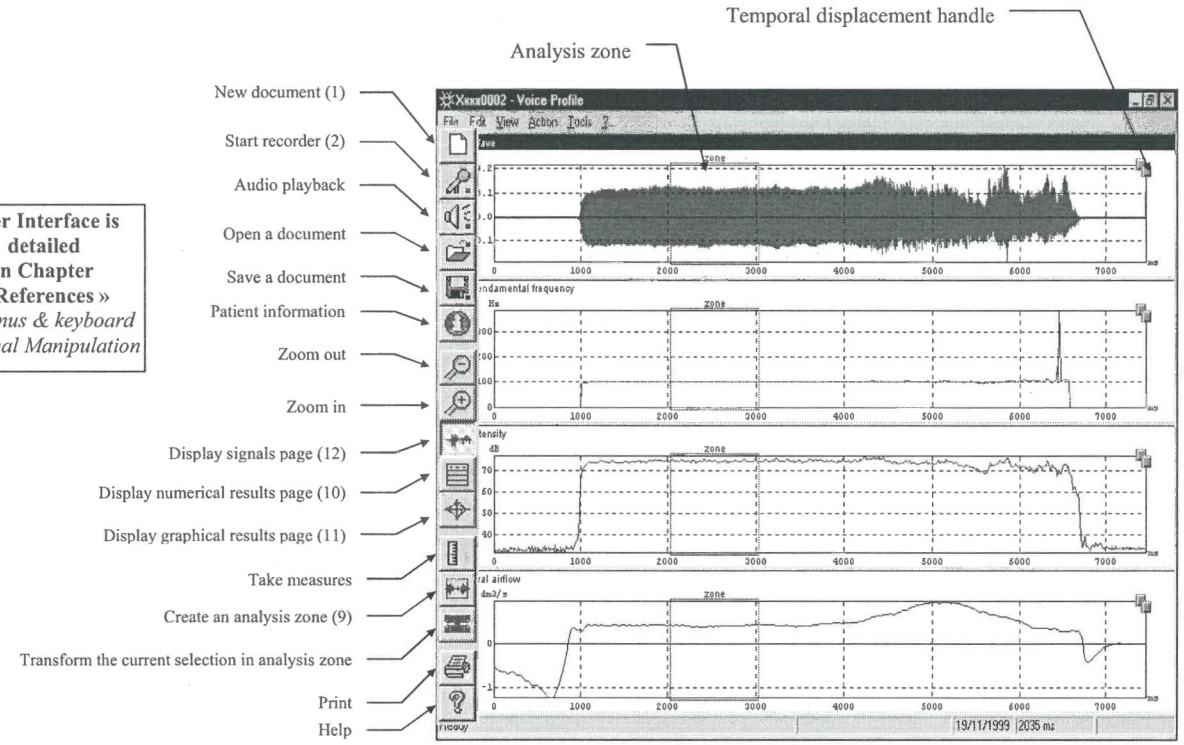
Launch the SESANE software by clicking this icon in Windows task bar.

In SESANE, enter the patient information :

Then double click on this icon :

Using Voice Profile

Main window



User Interface is detailed in Chapter « References »
§ Menus & keyboard
§ Signal Manipulation

Protocol

(1) Create a new document if necessary
(2) Start real time display.

The recording control window appears.

[EVA AERODYNAMIC]
Move away the patient from the mouthpiece.
(3) Calibrate the sensors, wait three seconds. *The airflow level must be at zero.* Replace the patient in position.

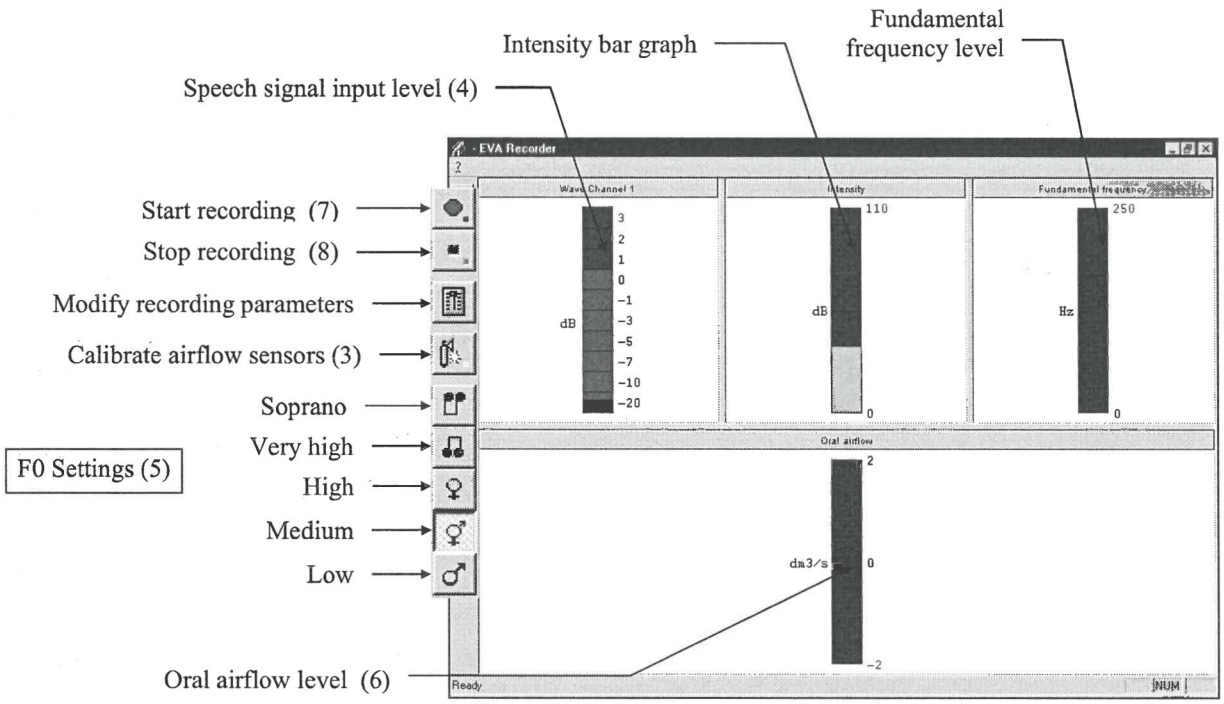
Make a try of a sustained « a » .
(4) Verify the recording level of the acoustic input vu-meter. Beware of not reaching +3 dB while recording. If necessary, adjust the volume button of INPUT 1-LEFT.
A low signal may indicate a bad position of the selector MASK - MICRO - LINE
(5) Set up the register of fundamental frequency depending on the patient tessitura.

[EVA AERODYNAMIC]
(6) Verify that the airflow level is correct. If necessary, verify that the patient is correctly pressed against the mask.

(7) Start recording.
The patient produces a sustained « a » at comfortable and usual pitch.
(8) Stop recording

The main window appears

Recording control window



(9) Create an analysis zone. *A zone cursor appears on the displayed signals.* Move this zone on the most stable part of the vocal emission. To do so, move the mouse pointer to the left edge of the zone cursor, click the left button and maintain it down, then move the analysis zone.

On this duration, computations are performed.

(10) Visualize the numerical results.
(11) Visualize the graphical results.

Explore if necessary other parts of the patient production.

Save the document.
Print document.

Measurement

Voice quality assessment is performed on an observation window chosen on the recorded signal.

Observation zone creation

To create this analysis zone click on the icon :

A zone cursor appears on the displayed signals.

The zone duration is fixed. But it can be changed by using the Options (Menu Tools | Options) or by calling the object Menu | Properties (see after).

Observation zone placement

You have different ways to place this zone :
- on the most stable part of the vocal emission
- at a fixed time (ex : 200 ms) after the voiced attack.

To move it :
1. place the mouse pointer near the left edge of the zone cursor,
2. click the left mouse button and maintain it down,
3. move the analysis zone,
4. release

Editing observation zone

You can replace at any time this zone on another part of the recorded signal. All the analysis will be computed again.

To define manually a zone :

1. select a part of signal (place the mouse pointer at the beginning, press and hold down the Shift key + left mouse button, move the mouse until the end and release).
   You can control the length of your selection by watching in the status bar.

2. click on the icon of zone transformation :

The analysis zone is enlarged to the size of the selected zone, and the statistics are immediately performed.

To get back to the standard zone, click on the icon :

Results display

Results are displayed in separate pages : a statistics page which contains numerical and graphical results, and a radar page which summarise all theses results compared with the normality. To switch between these pages use these icons :

Statistics : Radar : Signals :

You can also change the current page
- by selecting the menu « View | Switch to xxx page »
- OR by using the keyboard accelerators « 1 », « 2 », « 3 »

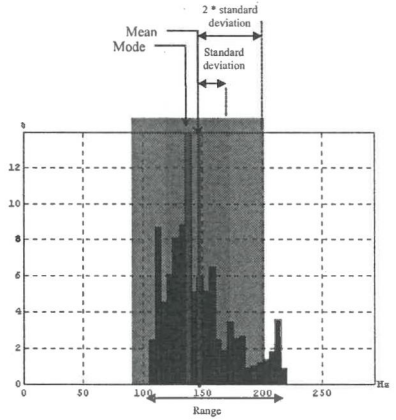
Statistics

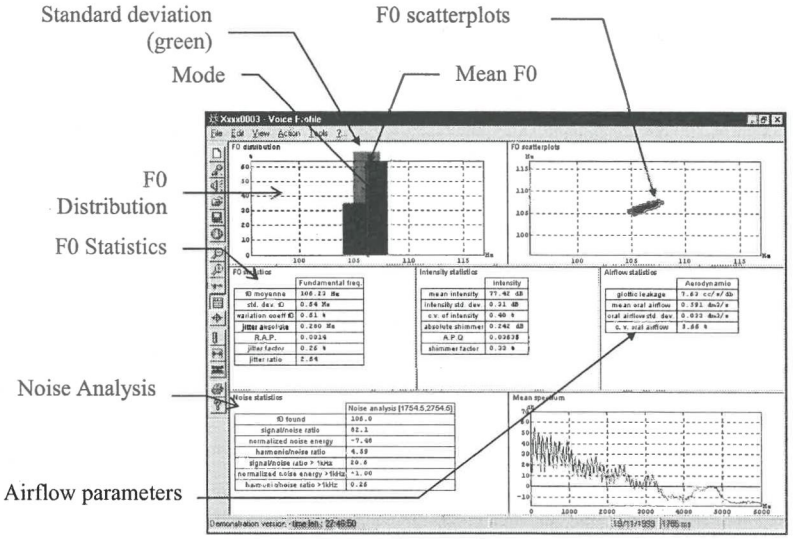
The program displays the mean, standard deviation, and coefficient of variation in percentage for each type of recorded signal.

Several instability indexes are proposed :

- JITTER computed on F0 (measures frequency differences between vocal cycles)
- SHIMMER on amplitude (measures amplitude variations between vocal cycles)
- aerodynamic measures which explore the presence or absence of airflow leakage trough the glottis during the phonation
- signal to noise ratio
- spectral analysis

Details can be read in the Technical Note (see after).

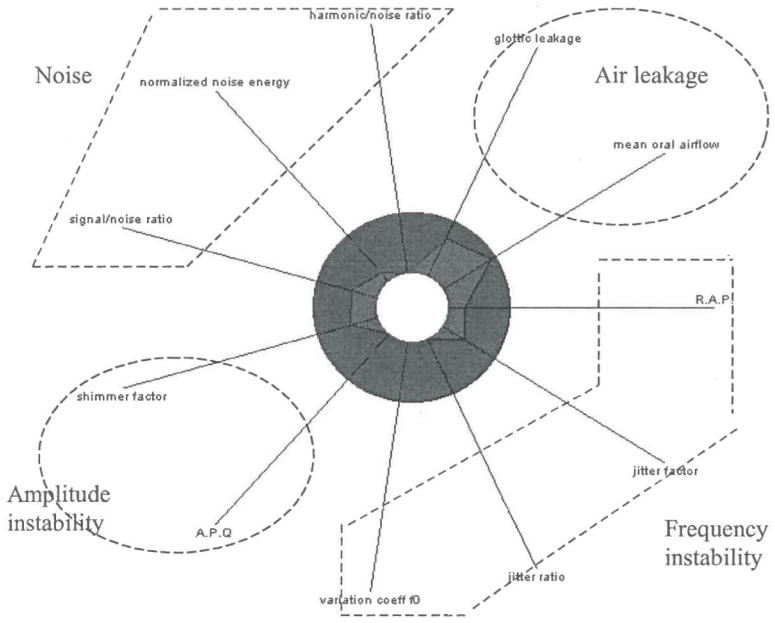




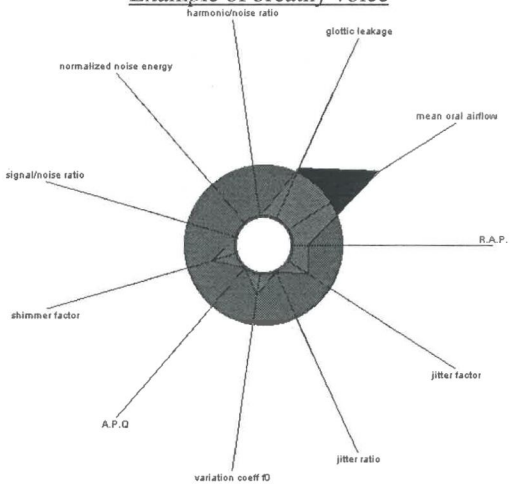
Radar display

This representation allows to visualise in a very synthetic way a qualitative image of the voice parameters. It is a radar presentation where each axis explores a dimension of the voice. The circle shows the limits obtained with « normal » patients. If a measure exceeds this limit, it will be displayed outside the circle boundary. The values of these limits can be changed by using the Options (Menu Tools | Options) or by calling the object Menu | Properties (see after).

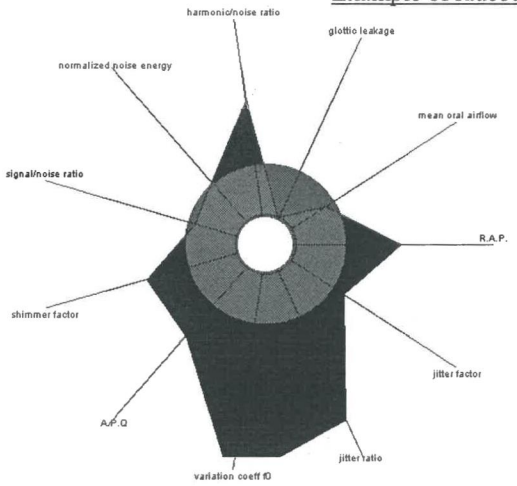
Example of normal voice



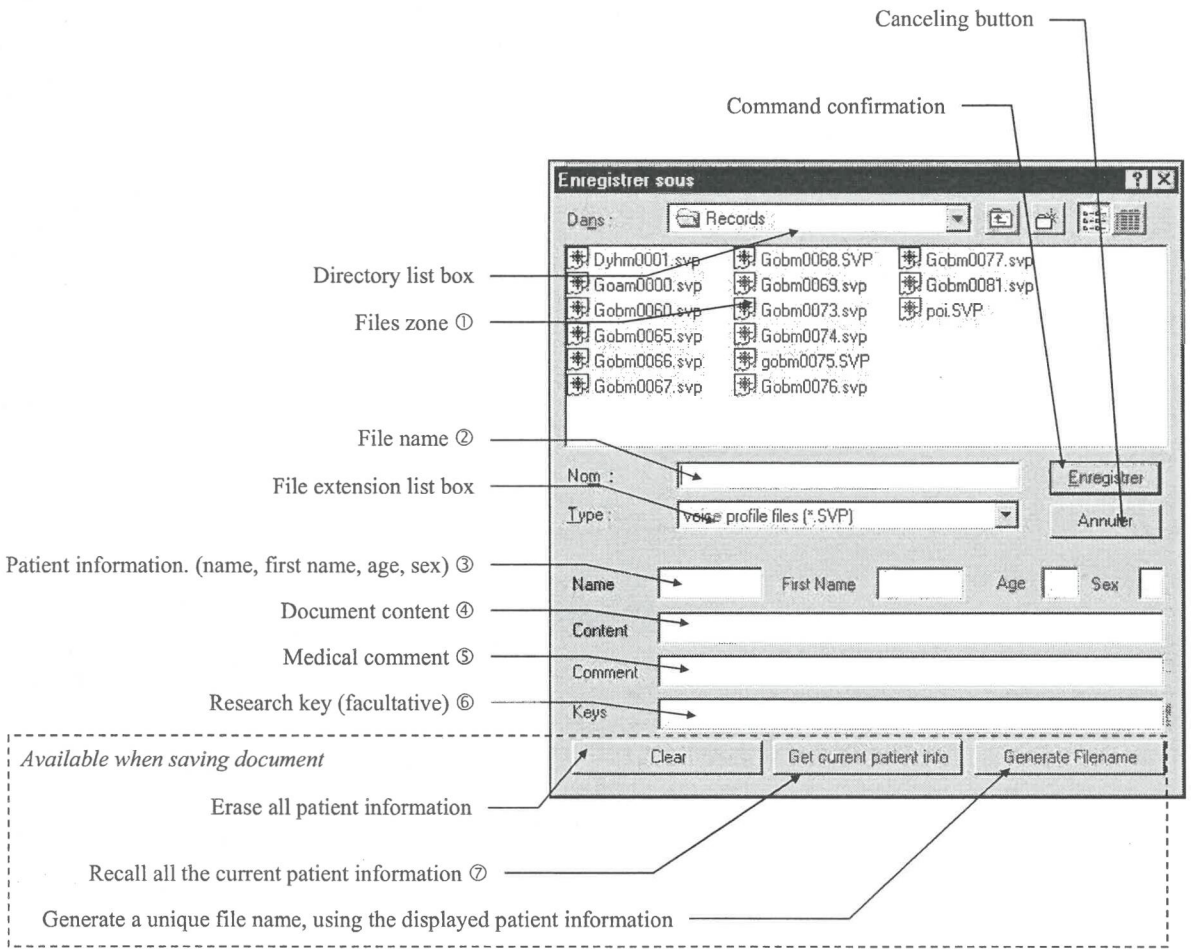
Example of breathy voice



Example of raucous voice



Data Management



Save a document

Method 1 : Click on ⑦. *The current patient information appear in the fields ③, ④, ⑤, ⑥. A unique filename is automatically generated in ②.* Confirm by clicking on ⑨.

Method 2 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Click on ⑧. *A unique filename appears in ②.* Confirm the saving by clicking on ⑨.

Method 3 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Enter a file name in ①. Confirm the saving by clicking on ⑨.

Open a document

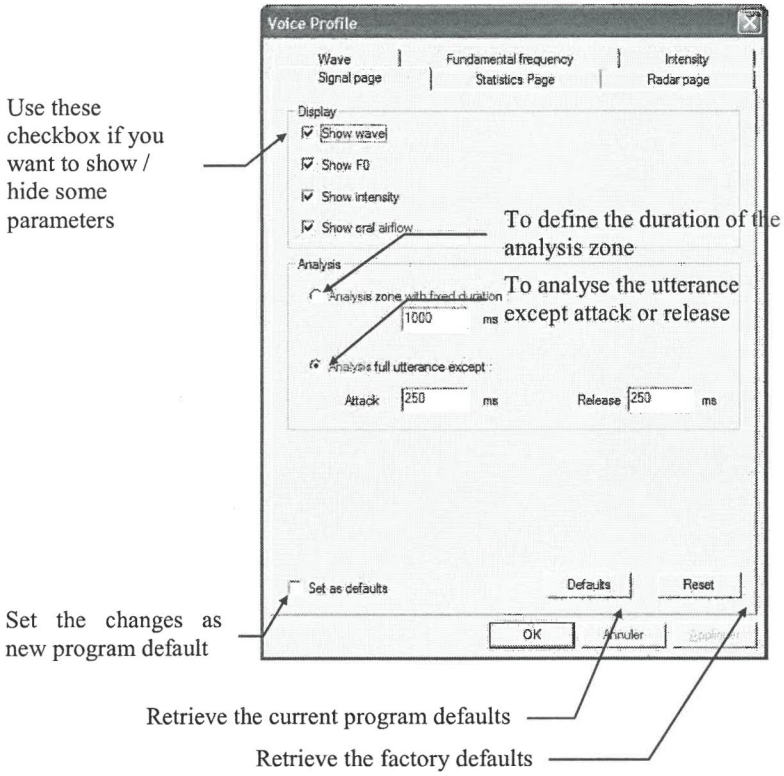
Select a document in ① by a single click with the left mouse button.. *The file name appears in ② with its information as well in ③, ④, ⑤ ⑥.* Confirm your choice by clicking on ⑨.

To obtain information about the current document

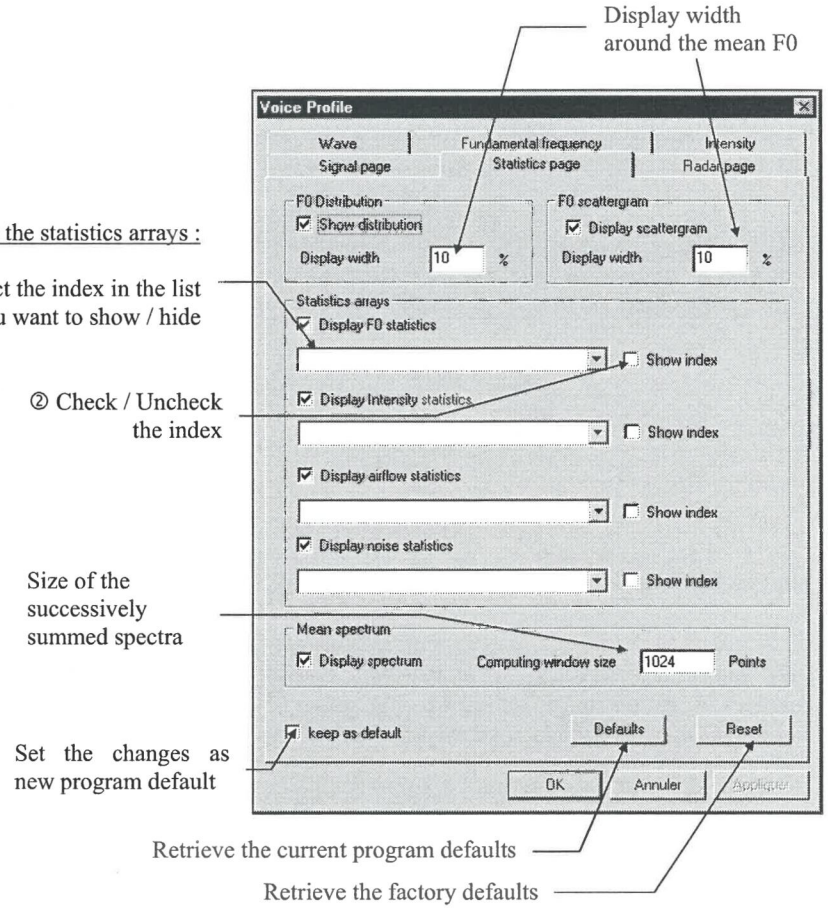
Options

You can modify the program parameters by selecting the menu « Tools | Options » or by typing the « O » key.

Signal Page Options



Statistics page options



Radar Page Options

This option box allows to modify the normality values used in the radar representation. To do so, you must :

① Select the index you want to modify, by clicking on its name.

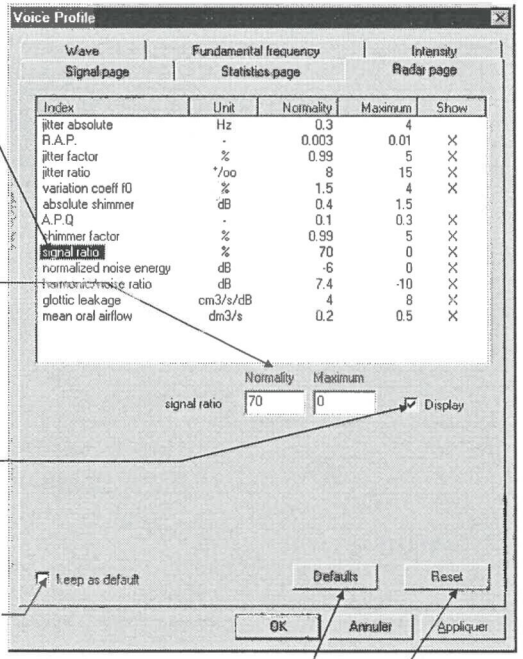
②The corresponding normality and its maximum value displayed is reported in theses text fields. Modify them, if you wish, the new values are immediately updated in the array.

③You may also choose to show or hide this index in the radar representation by selecting this check box.

Set the changes as new program default

Retrieve the current program defaults

Retrieve the factory defaults



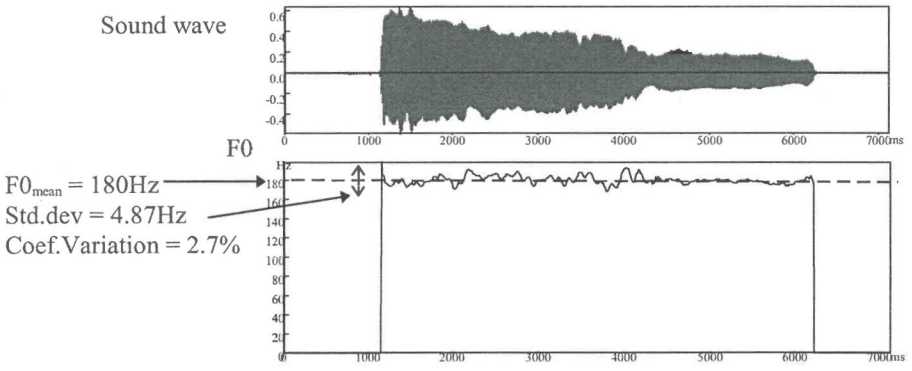
Technical Notes

Fundamental frequency statistics (F0)

These statistics explore the frequency of the vocal folds vibration.

(1) F0 Mean (Hz)
(2) F0 standard deviation
(3) Coefficient of variation of F0 (%)
(4) Mean Jitter (Hz)
(5) Relative Average Perturbation
(6) Jitter factor (%)
(7) Jitter ratio (‰)

	fundamental frequency
mean	179.97 Hz
std dev	4.87 Hz
c.v	2.71 %
CTC perturbation	0.677 Hz (jitter)
average perturbation	0.0015 (RAP)
percentage	0.38 % (jitter factor)
other	3.75 (jitter ratio)

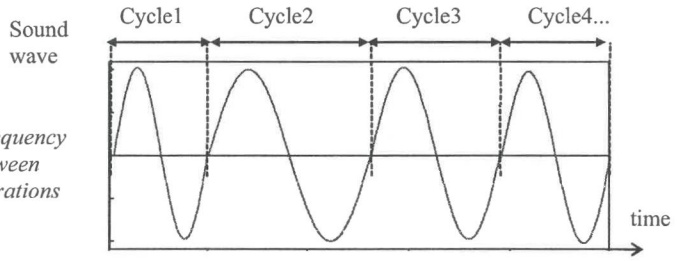


(1) **F0 mean** provides a global measure of pitch (high, medium, low...)

(2) Frequencies variations along the time can be seen as middle term instability of F0. It can be measured with the **F0 standard deviation,** which is relative to the scope in Hz of F0 variations around the average value.

(3) The **coefficient of variation** is interesting to relativize the standard deviation by comparing to the mean. It can be viewed as the scope in % of F0 variations around the average value. For example, with a 4.9 Hz standard deviation and a 180Hz average F0, the value of the coefficient of variation is 2.7%, which is important. With the same standard deviation but a 500 Hz mean F0, the value of the coefficient of variation is 0.98%, which is better. Finally, the coefficient of variation is the best index to explore the middle term instability of F0. It can be high with phenomena like pathological vibrato, quavering, neurological instability.

(4) The short term instability of F0 can be visible by comparing frequency variations between consecutive vibrations. **Mean JITTER** is the average value of the frequency differences between two consecutive vibrations. These variations are computed period per period, very precisely.



Example of frequency variations between successive vibrations

(5) **RAP** measures frequency variations but take into account three successive periods.

(6) **JITTER factor** is useful to relativize the mean jitter by dividing by the average value of F0. For example, with a 0.677 Hz mean jitter and a 180Hz average, we find a 0.38% jitter factor, low value. With the same mean jitter but a 80 Hz mean F0, we find a 0.84% jitter factor, more important value. Finally, the jitter factor is the best index to explore the short term instability of F0. It is well correlated with roughness.

(7) **JITTER ratio** measures the average difference of periods between two successive vibrations and relativize this value with the mean period.

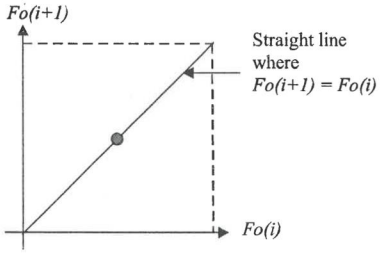
Remark : a high Jitter is always associated to a high coefficient of variation. The opposite is false. Some small successive F0 variations can furnish a low jitter. But if these variations are continuously positive (or negative), they increase the F0 scope and finally furnish a high coefficient of variation (typical example : vibrato).

About F0 phases diagram

F0 phases diagram is a scatterplot where the coordinates of a point are :
$x = Fo_i$ *(Fo of the* i^{th} *cycle)* , $y = Fo_{i+1}$ *(Fo of the* $i+1^{th}$ *cycle)*

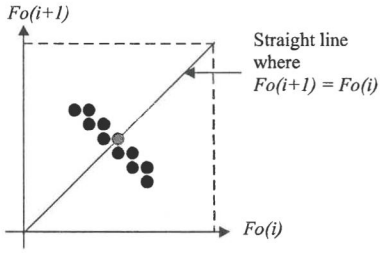
If the fundamental frequency is very stable (*Fo* constant), only a point appears on the scatterplot :

Scatterplot where Fo is very stable



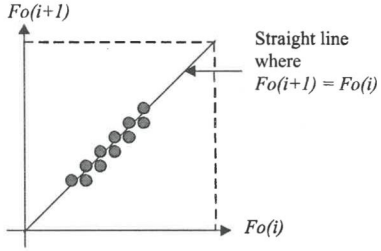
If the fundamental frequency is not stable in a short term (Fo_i very different from Fo_{i+1}), the points are distributed in a up-left to down-right line on the scatterplot :

Scatterplot with important jitter (Fo_i *very different from* Fo_{i+1} *)*



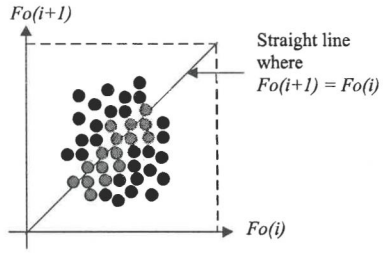
If the fundamental frequency is stable in a short term (low jitter) but not stable in a long term (ex : vibrato), the points are distributed in a down-left to up-right line on the scatterplot :

Scatterplot with important coefficient of variation (ex : vibrato)



If the fundamental frequency is never stable in a short and long term, the points are scattered :

Scatterplot with non stable Fo



Intensity/amplitude statistics

These statistics explore the sound amplitude and intensity.

(1) Mean Intensity (dB)
(2) Standard deviation of intensity (dB)
(3) Coefficient of variation of intensity (%)
(4) Mean Shimmer (dB)
(5) Average Perturbation Quotient (ratio)
(6) Shimmer factor (%)

	intensity
mean	86.67 dB
std dev	0.96 dB
c.v	1.11 %
CTC perturbation	0.153 dB (shimmer)
average perturbation	0.04739 (APQ)
percentage	0.19 % (Shimmer factor)
other	

(1) **The mean intensity** provides a global measure of loudness (poor, medium, strong...)

(2) The **standard deviation** gives information on the scope in dB about intensity variation around the average value.

(3) The **coefficient of variation** is necessary to relativize the standard deviation according to the mean intensity.

The previous parameters are based on the intensity which is measured with an 10 ms integration time, independently from the F0.

The following parameters are computed on the amplitude of each vibration.

(4) The short term instability of amplitude can be visible by comparing amplitude variations between consecutive vibrations. **Mean SHIMMER** is the average value of the amplitude ratios between two consecutive vibrations. This value is generally converted in dB. These variations are computed period per period, very precisely.

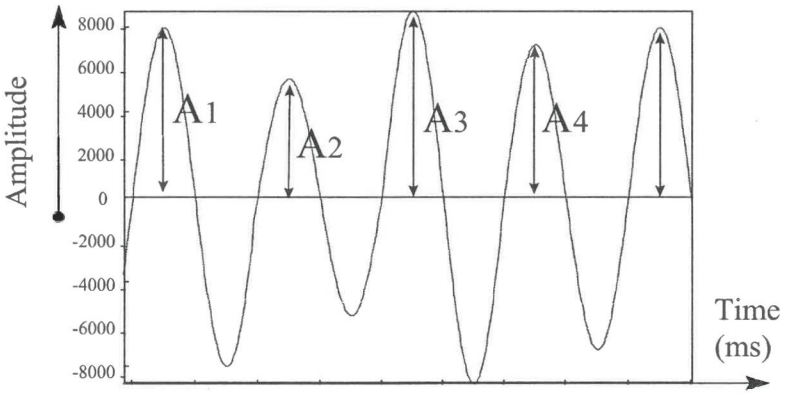
(5) **APQ** measures amplitude variations but take into account 11 successive periods.

(6) **SHIMMER factor** is useful to relativize the mean shimmer according to the mean amplitude.

Remark :

Mean, standard deviation and coefficient of variation in intensity are measured on the intensity curve which is independent from the recording level.

Instability parameters of amplitude (shimmer, APQ) are computed on the sound wave. Changing the input level during the recording time can spoil the results.



Noise statistics

Theses statistics explore the presence (or absence) of noise during phonation. This noise is due to turbulent flows caused by a bad closure of the vocal folds. We call it « additive noise ». A very unstable vibration can also be detected with this analysis : the difference of the f0 from its mean value is detected as a modulation noise.

This analysis is performed with temporal and spectral methods.

Harmonic/Noise Ratio is computed using a temporal method as described by Yumoto et al. (E.Yumoto, W.Gould, (1982) « Harmonics-to-noise ratio as an index of the degree of hoarseness », J.A.S.A, 71(6), 1544-1550) :
25 consecutive pitch periods of the sound wave are averaged ; H is the energy of the averaged wave form, while N is the mean energy of the differences between the individual periods and the averaged wave form. The ratio H/N, is computed along the time and the value is given in dB.

Signal Ratio is computed using a spectral method as described by Hiraoka et al. (N. Hiraoka, Y. Kitazoe, H.Ueta, (1984), « Harmonic-intensity analysis of normal and hoarse voices », J.A.S.A, 76(6), 1648-1651) :
we consider that the speech signal is the sum of two components :

- a periodic component (F0 & harmonics)
- a noise component (the rest)

The mathematical sum of theses two components is considered as the full signal.

SR Relative Signal Intensity = Energy (*F0* + *Hi*) / Total energy (%)
signal ratio is computed on the whole spectrum.
signal ratio [f > 1kHz] is computed on the spectrum part above 1 kHz.

Normalized Noise Energy is computed using a spectral method as described by Kasuya et al. (H.Kasuya, S.Ogawa, K. Mashima, S.Ebihara, (1986), « Normalized noise energy as an acoustic measure to evaluate pathologic voice », J.A.S.A, 80(5), 1329-1334 :
the method is very similar to the previous one except in the final formula where

NNE Normalised Noise Energy = 10. Log [Energy(noise) / Total Energy] (dB)

Aerodynamic Measurements

These statistics explore the presence or absence of airflow leakage trough the glottis during the phonation.

$$\text{Glottic leakage} = \frac{OAF_{mean}}{Intensity_{mean}} \quad \text{in (cm3/s/)/dB}$$

This index evaluates the quantity of air necessary to produce a decibel, providing an estimate of glottic inefficiency.

Normality

Parameters displayed in radar representation :

Parameter	Unit	boundary « normality » / pathologic	Upper pathologic limit displayed	correlation with pathology*
Absolute Jitter	Hz	0.3	4	+
RAP	none	0.003	0.01	+
Jitter Factor	%	0.99	5	+
Jitter Ratio	‰	8	15	+
c.v. F0	%	1.5	4	+
Shimmer	dB	0.4	1.5	+
APQ	none	0.1	0.3	+
Shimmer factor	%	0.99	5	+
Signal Ratio	%	70	0	-
H/N ratio	dB	7.4	-10	-
NNE	dB	-6	0	+
Glottic leakage	cm3/s/dB	4	8	+
Oral Airflow	dm3/s	0.2	0.5	+

* The sign (+) means that higher is the parameter, higher the pathological aspect can be considered.
The sign (-) means that lower is the parameter, higher the pathological aspect can be considered.

Indexes Formulas

Fundamental Frequency indexes

Mean	mean (Hz) = $\frac{1}{N}\sum_{i=1}^{N} F0_i$
std dev	standard deviation (Hz)= $\sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(F0_i - F0_{moy}\right)^2}$
c.v	coefficient of variation (%) = $100 \times \frac{\text{standard deviation}}{mean}$
Cycle to Cycle perturbation	Mean Jitter (Hz) = $\frac{1}{N-1}\sum_{i=1}^{N-1}\left\|F0_i - F0_{i+1}\right\|$
Average perturbation	Relative Average Perturbation RAP= $\frac{\frac{1}{N-2}\sum_{i=2}^{N-1}\left\|\frac{T0_{i-1}+T0_i+T0_{i+1}}{3} - T0_i\right\|}{T0_{moy}}$
percentage	Jitter factor (%) = $100 \times \frac{\text{mean jitter (Hz)}}{F0_{mean}}$
	Jitter ratio (‰) = $1000 \times \frac{\text{mean jitter (ms)}}{T0_{meany}}$

Intensity/amplitude indexes

Mean	mean (dB SPL) = $\frac{1}{N}\sum_{i=1}^{N} Intensity_i$
std dev	standard dev. (dB SPL) = $\sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(Intensity_i - Intensity_{moy}\right)^2}$
c.v	coefficient of variation (%) = $100 \times \frac{\text{standard deviation}}{mean}$
Cycle to Cycle perturbation	$\text{shimmer}_{dB} = \frac{1}{N-1}\sum_{i=1}^{N-1}\left\|20.\log\left(\frac{A_i}{A_{i+1}}\right)\right\|$
Average perturbation	Amplitude Perturbation Quotient APQ = $\frac{\frac{1}{N-10}\sum_{i=6}^{N-5}\left\|\frac{A_{i-5}+\ldots+A_i+\ldots+A_{i+5}}{11} - A_i\right\|}{A_{mean}}$
percentage	Shimmer factor = $100 \times \frac{\text{shimmer}}{20.\log\left(A_{mean}\right)}$

Aerodynamic indexes

Glottic leakage = $\frac{OAF_{mean}}{Intensity_{mean}}$ in (cm3/s/)/dB

Maximal Phonation Time

This program allows to assess the laryngeal efficiency, i.e. the relation between the aerial energy emitted and the duration of the vocal production, indirectly estimating the glottis leakage (pneumophonatory quotient).

Principle

1. Recording of a sustained « a » until vocal extinction.
2. Four windows are displayed corresponding to the sound, the fundamental frequency (Hz), the intensity (dB), et and the oral airflow (dm^3/s).
3. Two cursors corresponding to the beginning and the end of the voiced signal appear automatically or manually. Calculations are performed between these two cursors.

Preparation

Equipment

Complete version	Acoustic version
Place a disinfected mask on the mouthpiece. Choose a mask that will fit well with the patient face. Do not stretch too much the mask to avoid splitting the synthetic material	Place the patient at 30 cm from the on stand microphone. Ensure that he does not move
Turn the selector **INPUT 1-LEFT** on **MASK**	Turn the selector **INPUT 1-LEFT** on **MICRO**.

Software

Launch the SESANE software by clicking this icon in Windows task bar.

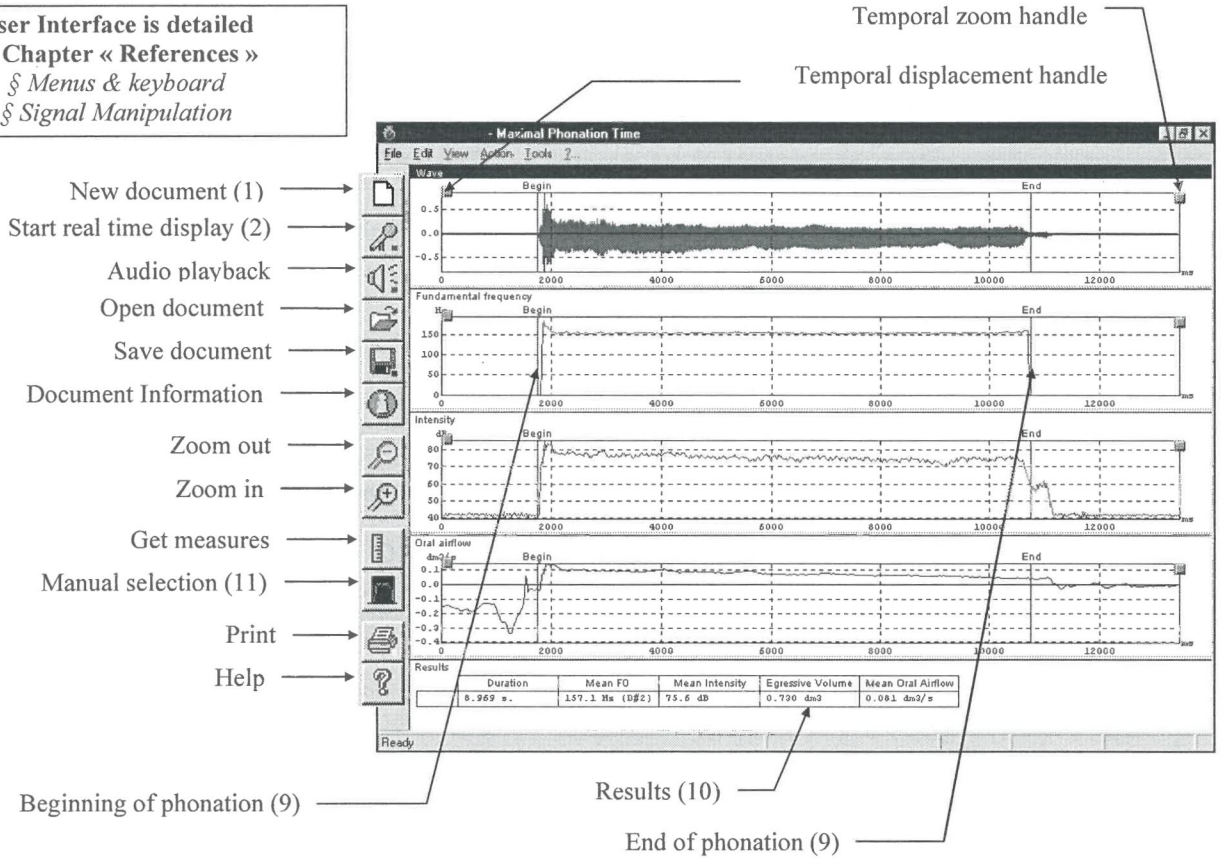
In SESANE, enter the patient information :

Then double click on this icon :

Using Maximal Phonation Time

Main Window

User Interface is detailed in Chapter « References »
§ Menus & keyboard
§ Signal Manipulation



Protocol

(1) Create a new document if necessary
(2) Start real time display.

The recording control window appears.

[EVA AERODYNAMIC]
Move away the patient from the mouthpiece.
(3) Calibrate the sensors, wait three seconds. *The airflow level must be at zero.* Replace the patient in position.

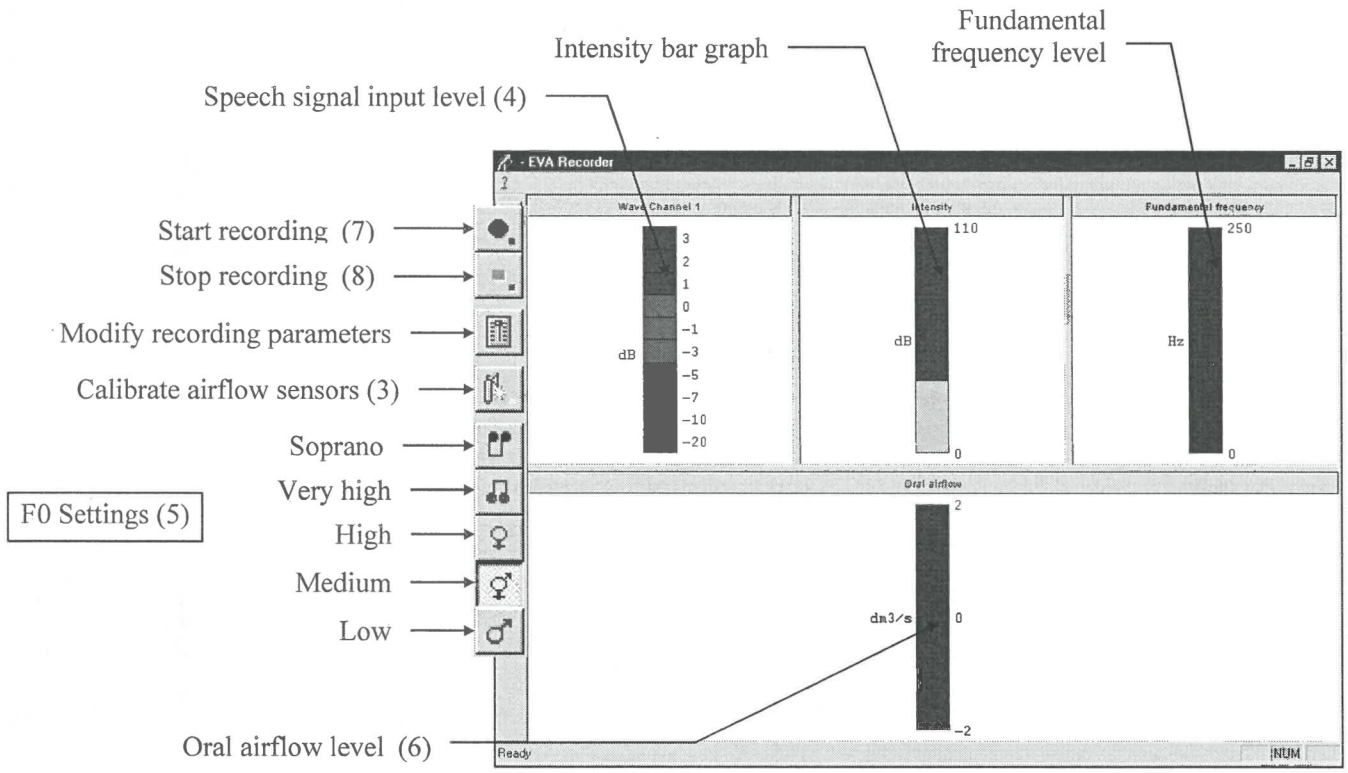
Make a try of a sustained « a » .
(4) Verify the recording level of the acoustic input vu-meter. Beware of not reaching +3 dB while recording. If necessary, adjust the volume button of INPUT 1-LEFT.
A low signal may indicate a bad position of the selector MASK - MICRO - LINE
(5) Set up the register of fundamental frequency depending on the patient tessitura.

[EVA AERODYNAMIC]
(6) Verify that the airflow level is correct. If necessary, verify that the patient is correctly pressed against the mask.

(7) Start recording.
The patient produces its longest sustained « a » at comfortable and usual pitch.
(8) Stop recording

The main window appears

Recording control window



9) Cursors showing the beginning and the end of the signal appear automatically. It is possible to move them if necessary. To do so :

- place the mouse pointer near the cursor
- click and hold down the left mouse button
- move the mouse to the right place
- release the mouse button

(10) Results appear in the array

(11) It is possible to select manually the maximal phonation time :

- select a zone (place the mouse pointer at the beginning, press and hold down the Shift key and left mouse button as well, move the mouse to the end, release)
- push down the icon (11)

One can detect automatically the maximal phonation time by using the menu Action | Automatic boundaries or by pressing the keyboard shortcut « A ».

Save the document.

Print the document.

Measurement

The Maximal Phonation Time assessment needs two cursors :

- beginning of phonation
- end of phonation

Boundaries

Automatic cursors

In a standard mode, phonation time is detected by automatic algorithm.

If necessary, you can call this automatic detection by selecting the Menu « Action | Automatic boundaries » or by using the keyboard accelerator « A ».

Manual cursors

You can set manually the boundaries. To do that,

- select a zone (place the mouse pointer at the beginning, press and hold down the Shift key + left mouse button, move the mouse until the end and release)
- press the icon
- or select the menu « Action | Manual Selection »
- or use the keyboard accelerator « S »

You can move these cursors if necessary.
To do so,

- place the mouse pointer near the cursor
- click and hold down the left mouse button
- move the mouse where you want
- release the left button.

Measures displayed

The measures displayed in the array are:

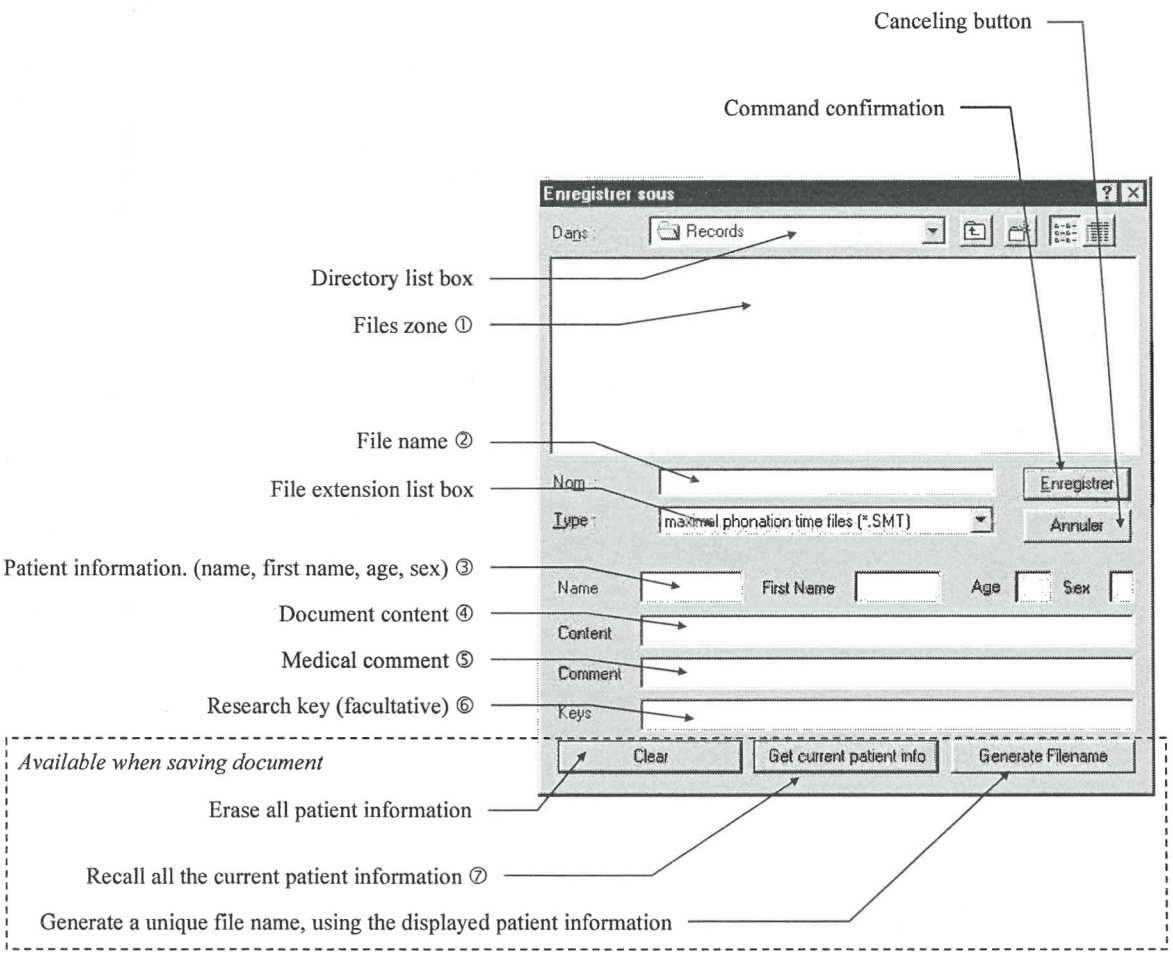
- the duration = maximal phonation time (in seconds)
- the mean F0 (in Hz and musical note)
- the mean intensity
- the mean oral airflow
- the volume expired

Note :

The Phonatory quotient is the ratio between the Vital Capacity (measured by spirometry technics) and the Maximal Phonation Time.

$$Phonatory\ Quotient(dm^3 / s) = \frac{Vital\ Capacity(dm^3)}{Maximal\ Phonation\ Time(s)}$$

Data Management



Save a document

Method 1 : Click on ⑦. *The current patient information appear in the fields ③, ④, ⑤, ⑥. A unique filename is automatically generated in ②.* Confirm by clicking on ⑨.

Method 2 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Click on ⑧. *A unique filename appears in ②.* Confirm the saving by clicking on ⑨.

Method 3 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Enter a file name in ①. Confirm the saving by clicking on ⑨.

Open a document

Select a document in ① by a single click with the left mouse button.. *The file name appears in ② with its information as well in ③, ④, ⑤ ⑥.* Confirm your choice by clicking on ⑨.

To obtain information about the current document

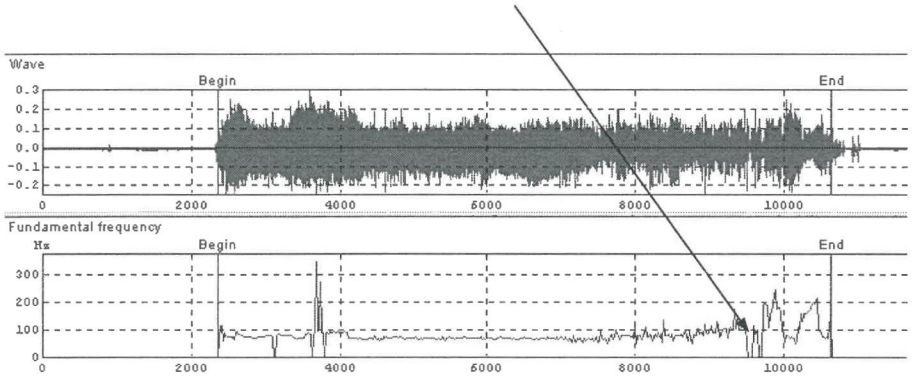
Options

You can modify the program parameters by selecting the menu « Tools | Options » or by typing the keyboard accelerator.« O ». You can also use the Object Menu « Properties » (right mouse button).

The specific options of this application are following.

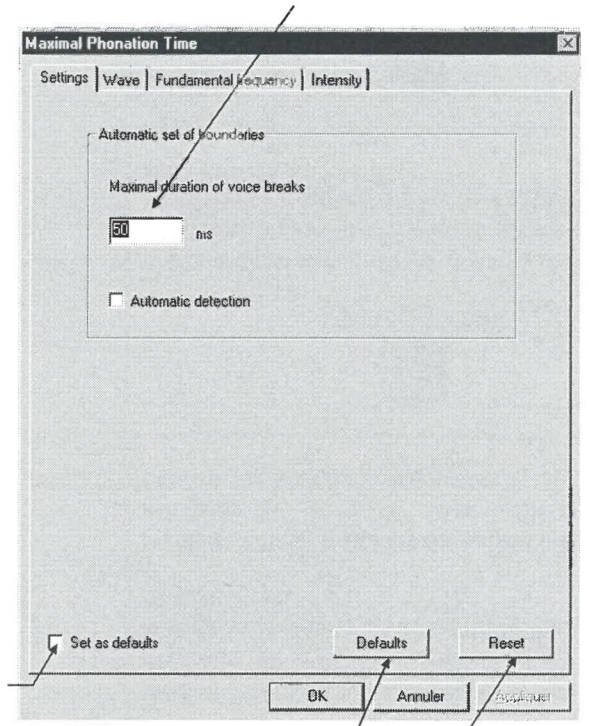
Automatic boundaries settings

With severe voice disorders, some voice breaks can appear during the phonation.



These breaks can trouble the automatic boundaries algorithm: it can consider that a voice break is the end of the phonation, which is not necessary the case. To avoid such a problem, the algorithm does not take into account these breaks if they are short enough.

By calling the options, you can fix a value which is the maximal duration of the breaks.



Set the changes as new program default

Retrieve the current program defaults

Retrieve the factory defaults

Real Time Feedback

Real Time Biofeedback is a tool useful to :

- assess speech production, especially in case of dysarthria or hearing impair (formants of vowels produced are displayed in real time)
- help singers in training (spectrum is displayed in real time)

Principle

Practically, the subject pronounces vowels and can see in real time the result on screen.

The left window displays the FFT and LPC spectrum. 1st and 2nd formants are automatically detected.

Preparation

Equipment

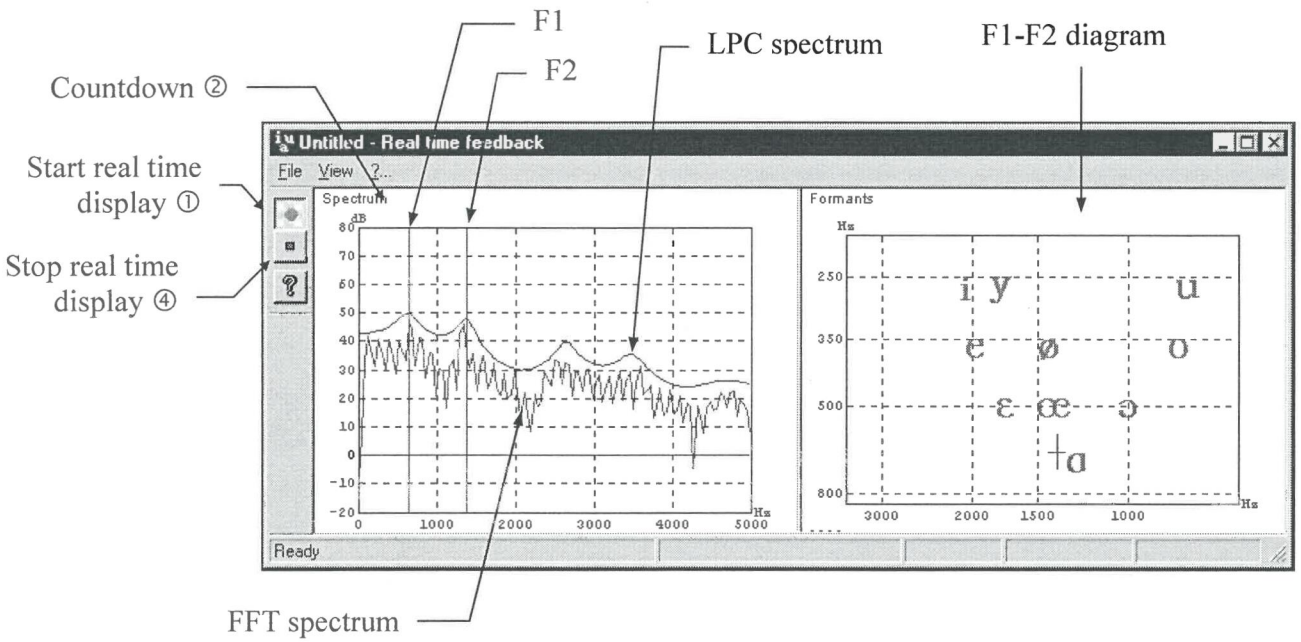
Patient is standing up in front of the microphone.

Software

Launch the SESANE software by clicking this icon in Windows task bar.

Double click on this icon :

Using Real Time Feedback



Protocol

① Start real time display

② **Wait 5 seconds before speaking (use the countdown in the spectrum window title bar)**

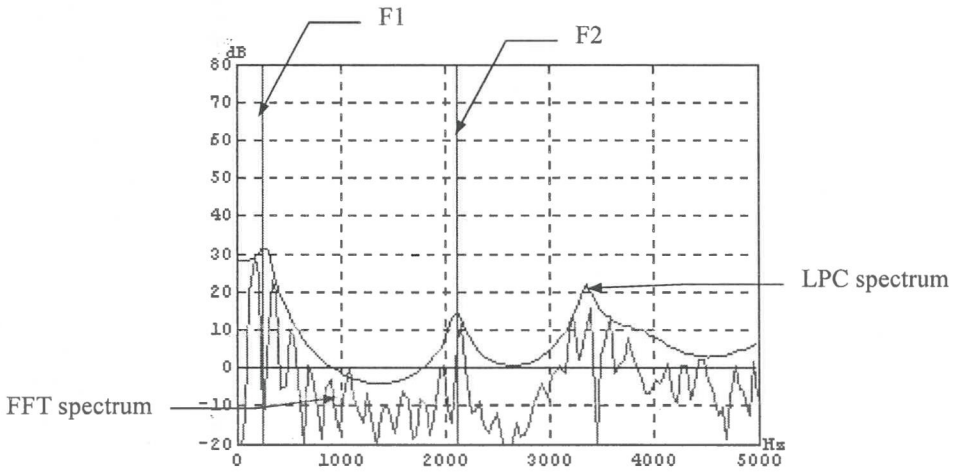
③ Speak

④ Stop the real time recorder

Measurement

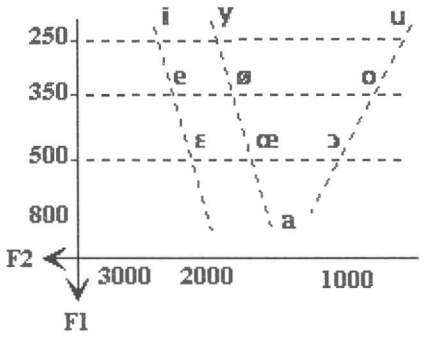
Spectrum Window

The left window displays the FFT and LPC spectrum. 1st and 2nd formants are automatically detected.

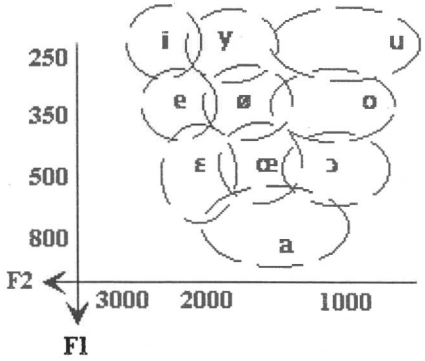


F1-F2 diagram

According to these values a target is displayed in the F1-F 2 diagram

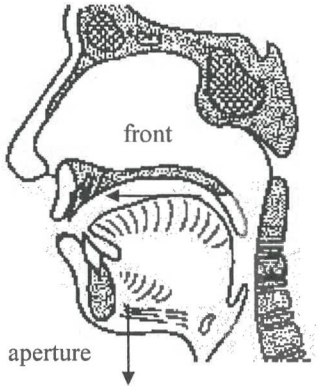


F1-F2 Diagram



Dispersions

The directions of F1 and F2 axis are chosen to be similar to a physiologic representation :



F1⇔ Aperture (jaws position)
The more the jaws are opened, the higher is F1.

F2⇔ Front position of tongue
The more the articulation is front, the higher is F2.

Lips also change F2 value (when lips are used for articulation, F2 decreases)

Data management

None.

Options

Available in next versions.

Digital tape recorder

Allows to record sentences (unlimited duration) on 5 separate tracks, for making comparisons of voice quality at different steps of a patient therapy.

Preparation

Equipment

Patient is standing up in front of the microphone.

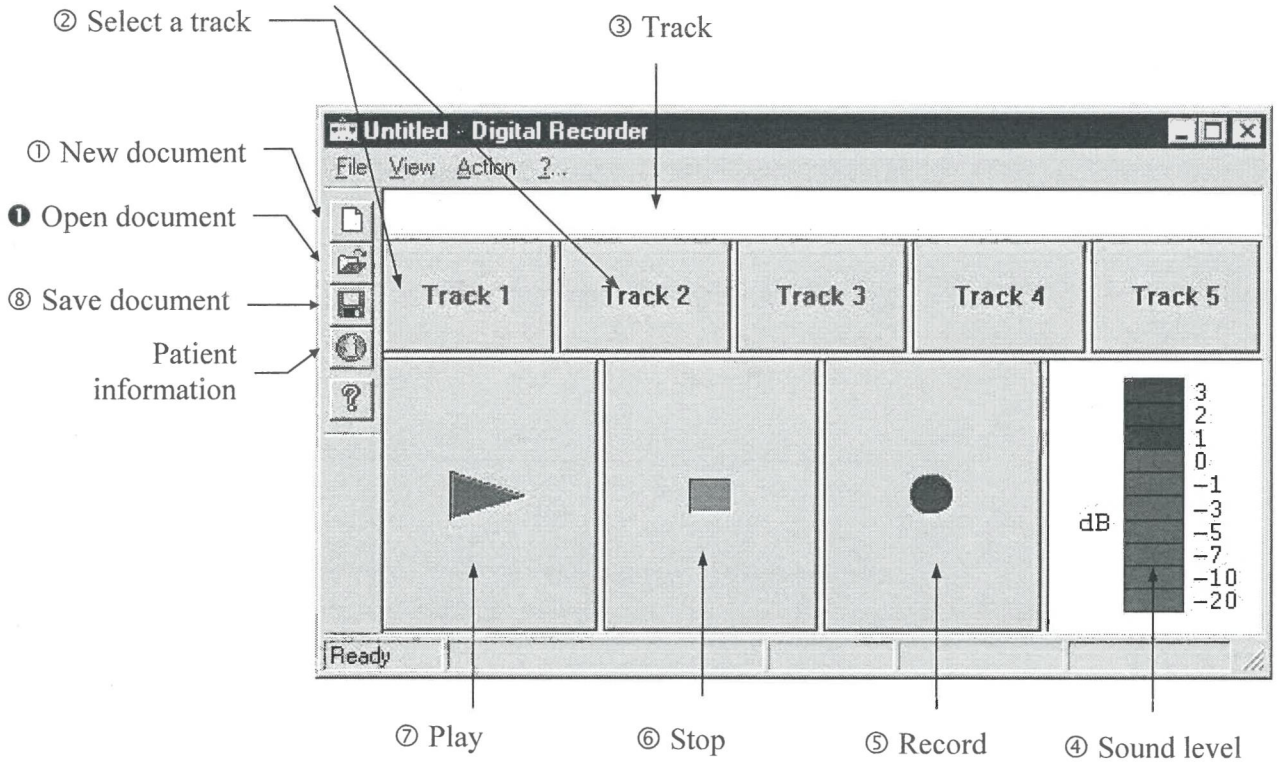
Software

Launch the SESANE software by clicking this icon in Windows task bar.

In SESANE, enter the patient information :

Double click on this icon :

Using Digital Tape Recorder



Procedure

① For a new patient, create a new document

❶ To add a track of a registered patient, open a document.

② Select a track.

③Take care to select a free track.

④ Speak to test the level. Verify that the sound level is correct (level < 3)

⑤ Click on the Record button. Speak.

⑥ When the patient has finished to speak, click on the Stop button

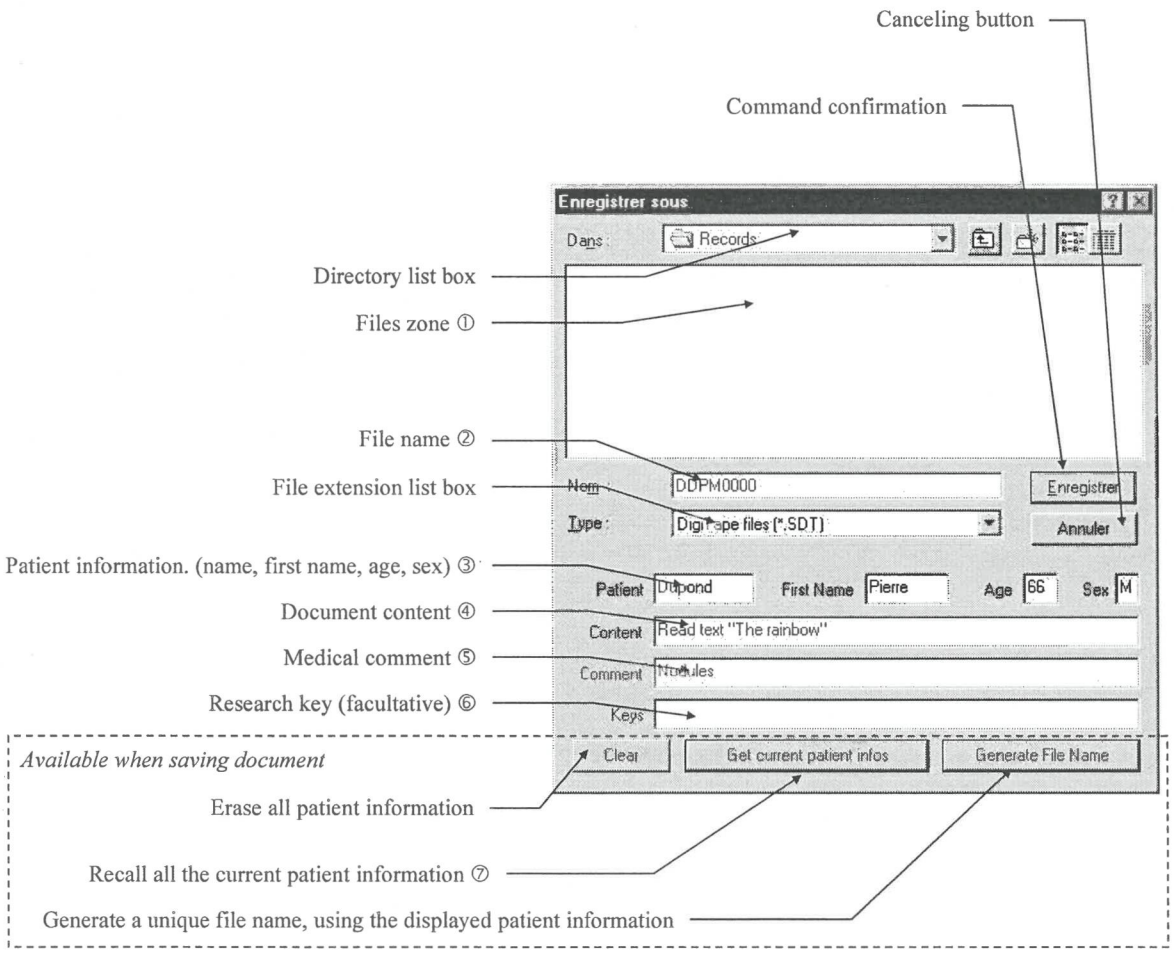
⑦ Click on the Play button if necessary.

⑧ Save the document

To compare with previous recording :

- select the track ②
- check the track identifier ③
- playback ⑦

Data Management



Save a document

Method 1 : Click on ⑦. *The current patient information appear in the fields ③, ④, ⑤, ⑥. A unique filename is automatically generated in ②.* Confirm by clicking on ⑨.

Method 2 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Click on ⑧. *A unique filename appears in ②.* Confirm the saving by clicking on ⑨.

Method 3 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Enter a file name in ①. Confirm the saving by clicking on ⑨.

Open a document

Select a document in ① by a single click with the left mouse button.. *The file name appears in ② with its information as well in ③, ④, ⑤ ⑥.* Confirm your choice by clicking on ⑨.

To obtain information about the current document

Measurement

None.

Options

None.

Glottal efficiency

This program allows to evaluate the glottal efficiency, i.e. a ratio between the quantity of acoustic energy and the quantity of aerodynamic energy used for this production. These indexes explore the notion of vocal strain..

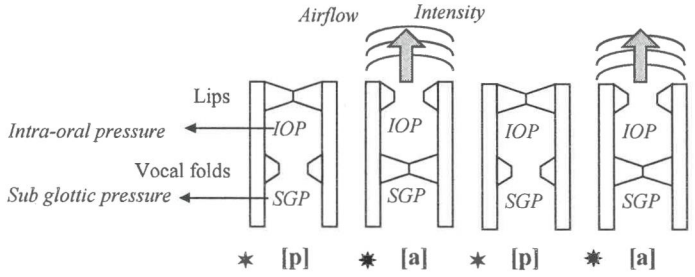
Principle

Smitheran et Hixon method : airway interrupted method.

Recording of the sentence « pa pa pa pa pa pa ... » with the intensity, intra-oral pressure, and oral airflow parameters.

① On the /p/, the lips are closed and the glottis is open. An equilibrium of pressures is established in the vocal tract. The sub-glottal pressure can be estimated by measuring the intra-oral pressure.
② During the /a/ production, the lips are open, which doesn't allow an interesting measure of the pressure. However, the recording of the acoustic intensity, and the oral airflow allows to obtain a combination of values which produce a notion of glottal efficiency.

The user places a cursor on a peak pressure (during the /p/ sustaining) and asks for an automatic adjustment of the analysis zones on intensity and airflow. Computations are made between theses values.



Preparation

Equipment

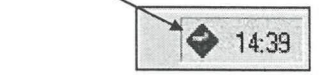
Place a disinfected mask on the mouthpiece. Choose a mask that will fit well with the patient face.

Do not stretch too much the mask to avoid splitting the synthetic material.

Place a disposable catheter on the left pressure plug of the mouthpiece.
Turn the selector **INPUT 1-LEFT** on **MASK**.

Software

Launch the SESANE software by clicking this icon in Windows task bar.

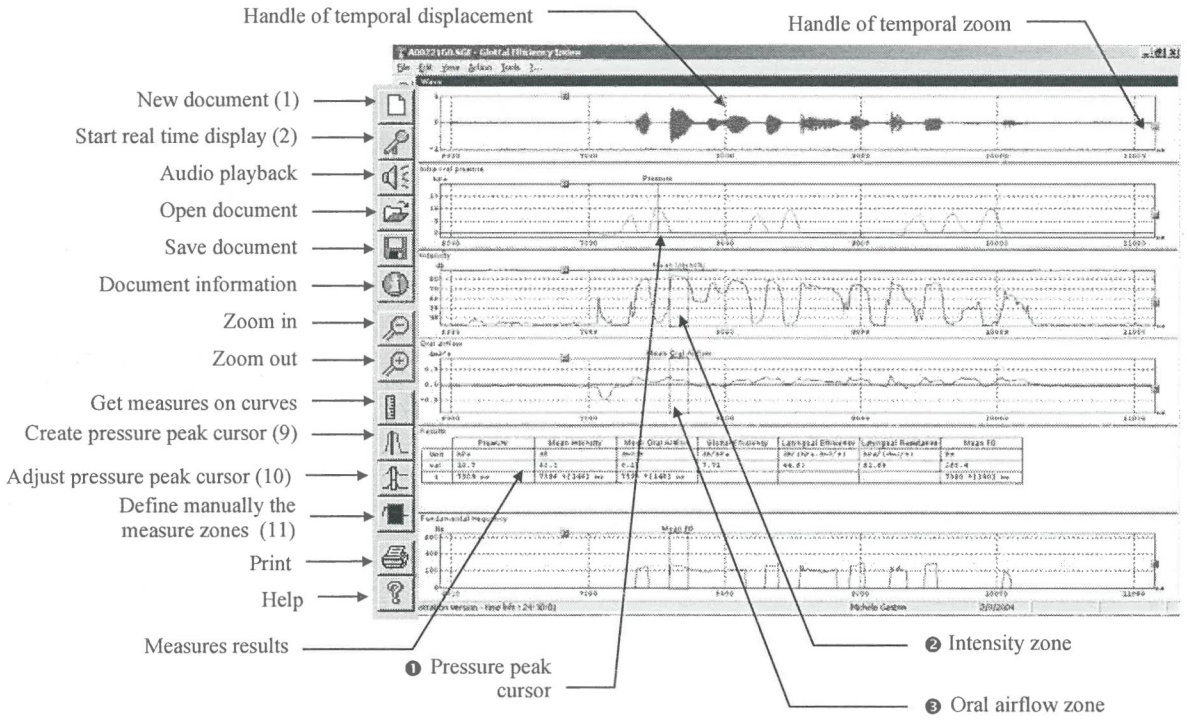


In SESANE, enter the patient information :

Then double click on this icon :

Using Glottal Efficiency

Main window



User Interface is detailed in Chapter « References »
§ Menus & keyboard
§ Signal Manipulation

Protocol

(1) Create a new document

(2) Start real time display. *The record control window appears..*

Move away the patient from the mouthpiece.

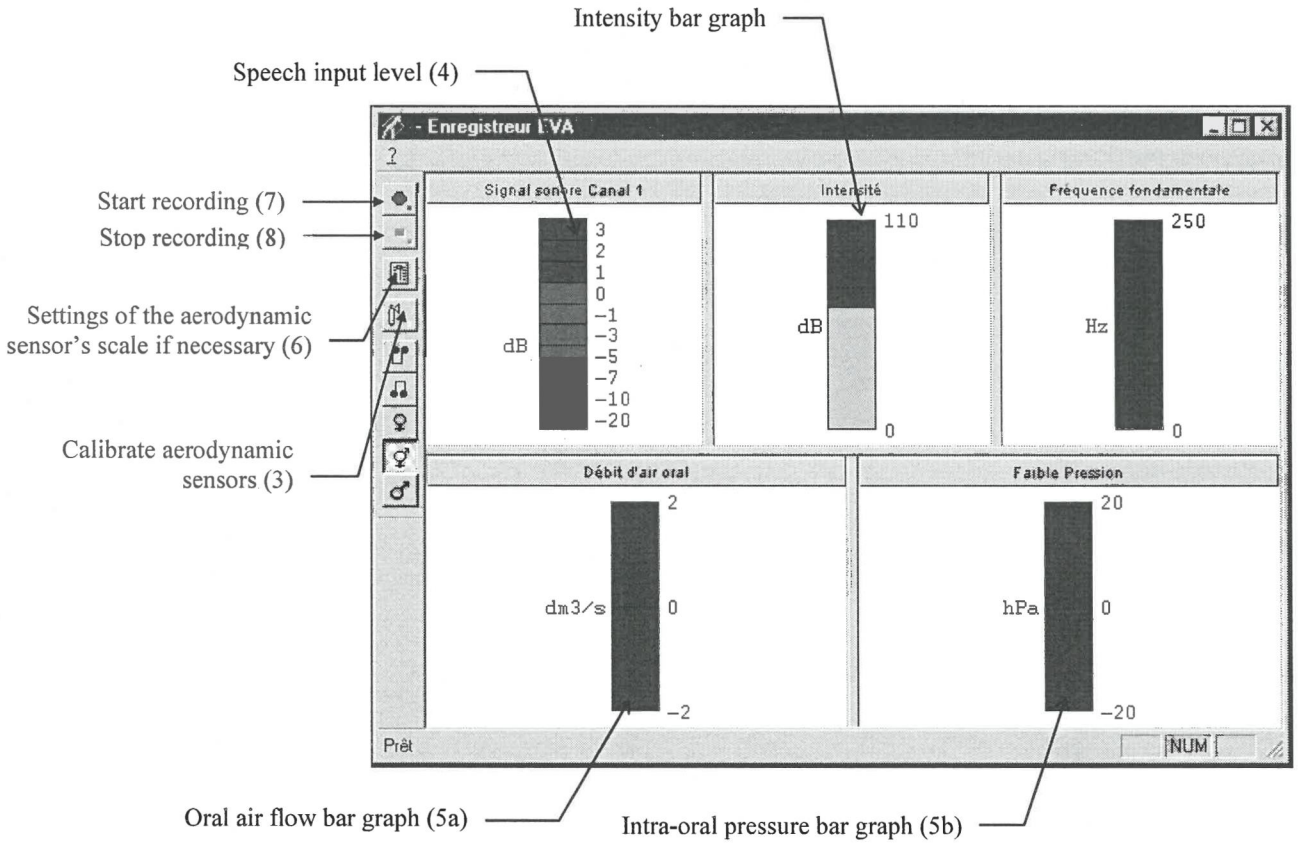
(3) Calibrate the sensors, wait three seconds. *The airflow level must be at zero.*
Replace the patient in position.
Verify that the patient is correctly pressed against the mask, and check that the probe inside his mouth is not pinched by its teeth, nor obstructed by saliva.

Make a test of « pa pa pa pa pa » at usual pitch and intensity.

(4) Verify the recording level of the acoustic input vu-meter. Beware of not reaching +3 dB while recording. If necessary, adjust the volume button of INPUT 1-LEFT. A low signal may indicate a bad position of the selector MASK - MICRO - LINE.

(5)Verify that the oral air flow and pressure input level does not saturate during phonation. *In this case, the bar graph color turns yellow.*

Record control window



(6)Verify that the intra-oral pressure input level does not saturate during phonation. *In this case, the color bar graph turns yellow*

(7) Start recording

The patient pronounce its « pa pa pa pa pa» serial.

(8) Stop recording. *The main window appears*

(9) Create the peak pressure cursor. *Automatic measures are proposed and the results are displayed in the array.*

To perform manual measures, move the peak pressure cursor. To do so, move the mouse pointer near it, click and hold down the left mouse button, then move the cursor near of a peak pressure. Adjust the measures (10). *The cursor is automatically placed at the exact top of the peak, and two analysis zones are created on the intensity and air flow signals. The results are displayed in the result chart.*

If the automatically detected computing zones are not well placed, change their location (grab the left side of the zone, and drag the mouse, maintaining its left button down). One can define manually the zones by selecting a part of signal (hold the shift key and the left mouse button while moving) then use the (11) command.

Save the document
Print the document.

Measurement

Measurements are performed using three cursors :

- ❶ a cursor which designates the peak pressure preceding the /p/ explosion
- ❷ a zone defining the intensity computed on the /a/
- ❸ a zone defining the oral airflow computed on the /a/

Cursors and Zone creation

The program creates automatically the cursor ❶ (peak pressure) at the maximal pressure value observable at screen. It places then the zones ❷ (intensity) and ❸ (oral airflow) on the /a/ following this peak pressure.

If the cursor ❶ (peak pressure) does not appear, use the icon
or select the menu « *Action | New peak cursor* »
or use the keyboard shortcut « N »

Manual selection and automatic adjustment

It is possible to get measures on another peak than the automatically selected one. To perform manual measurement :

1. move the mouse pointer near the cursor ❶, click and hold down the left mouse button, then move it near another peak pressure
2. click on the icon to adjust the ❷ and ❸ selection.
   Or select the menu « *Action | Adjust* »
   Or use the « A » keyboard shortcut

The cursor is placed exactly at the peak's top and two analysis zones are created on intensity and oral airflow curves. Results are displayed in the result chart.

Manual selection of the observation zones

If the automatically selected intensity and airflow zones do not seem to fit, you can move them (grab the left side of the zone, and drag the mouse, maintaining its left button down) One can define manually the observation zones ❷ et ❸. All the results will be computed again. To define manually an observation zone :

1. Create a selection zone (place the mouse cursor at the beginning, hold down the left mouse button, and the shift key at the same time, drag the mouse at the end of the selection, release)

   You can control the selection duration by looking the program state bar :

Selection duration

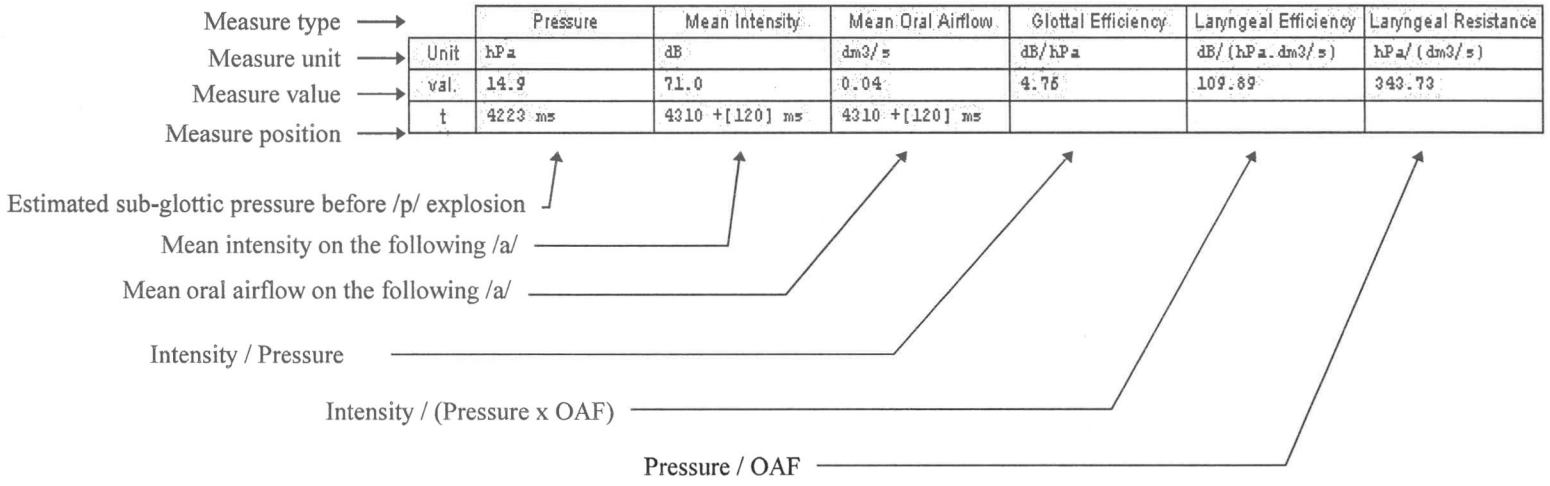
2. click on the icon
   or select the menu « *Action | Manual selection* »
   or use the « S » keyboard shortcut

The observation zone is resized to your selection and the statistics are computed immediately using these new data.

To define again automatically the observation zones :
select the menu « *Action | Adjust* »
or use the « A » keyboard shortcut

Indexes

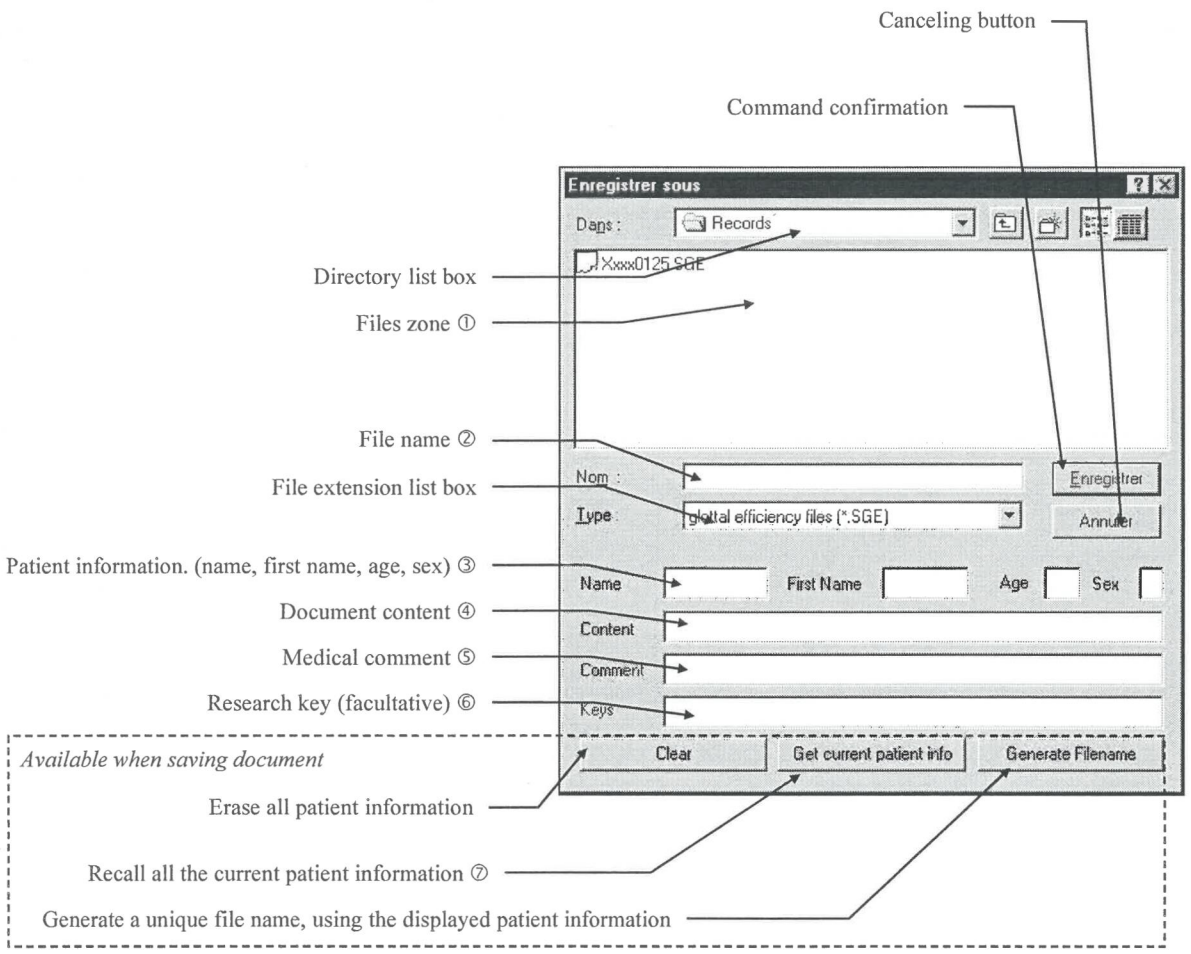
Results are displayed in this chart :



Normality

Index	Normality boundary	Pathology increases when the index
Sub glottic pressure	7 hPa	↗
glottal efficiency	12,5 dB/hPa	↘
laryngeal efficiency		↘
laryngeal resistance	40 Pa/dm3	↗

Data Management



Save a document

Method 1 : Click on ⑦. *The current patient information appear in the fields ③, ④, ⑤, ⑥. A unique filename is automatically generated in ②.* Confirm by clicking on ⑨.

Method 2 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Click on ⑧. *A unique filename appears in ②.* Confirm the saving by clicking on ⑨.

Method 3 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Enter a file name in ①. Confirm the saving by clicking on ⑨.

Open a document

Select a document in ① by a single click with the left mouse button.. *The file name appears in ② with its information as well in ③, ④, ⑤ ⑥.* Confirm your choice by clicking on ⑨.

To obtain information about the current document

Spirometry

Allows to evaluate respiratory volumes and to detect respiratory deficiencies.

Principle

Spirometry is an exam exclusively aerodynamic.

The patient must produce two or three cycles of deep respiration..

It may be necessary to use a « nose-pincher » to avoid air leakage through the nasal ways.

Preparation

Equipment

a) Choose an oral mask that will fit well with the subject face.

b) Plug the mask on the mouthpiece.

Do not stretch too much the mask to avoid spitting the synthetic material.

Software

Launch the SESANE software by clicking this icon in Windows task bar.

in SESANE, enter the patient information :

Double click on this icon :

Preparation

- Prepare the mouthpiece
- Enter the patient information
- start the program

the main window appears.

① Create a new document

Move away the patient from the mouthpiece

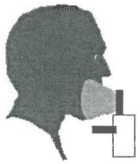
② Start real time display

The record control window appears.

Settings

③ Calibrate the aerodynamic sensors. Wait three seconds.
The airflow level must be at zero

Replace the patient in position.



Verify that the patient is correctly pressed against the mask,

While the patient is breathing, check the airtightness of the mask.

④Start recording.
The patient breathes deeply at least three times.

⑤Stop recording

Main window appears

Measurement

Two cursors are placed automatically at each side of an exhaling cycle. The results appear in a recapitulative chart.

⑥ Zoom if necessary.

if necessary :

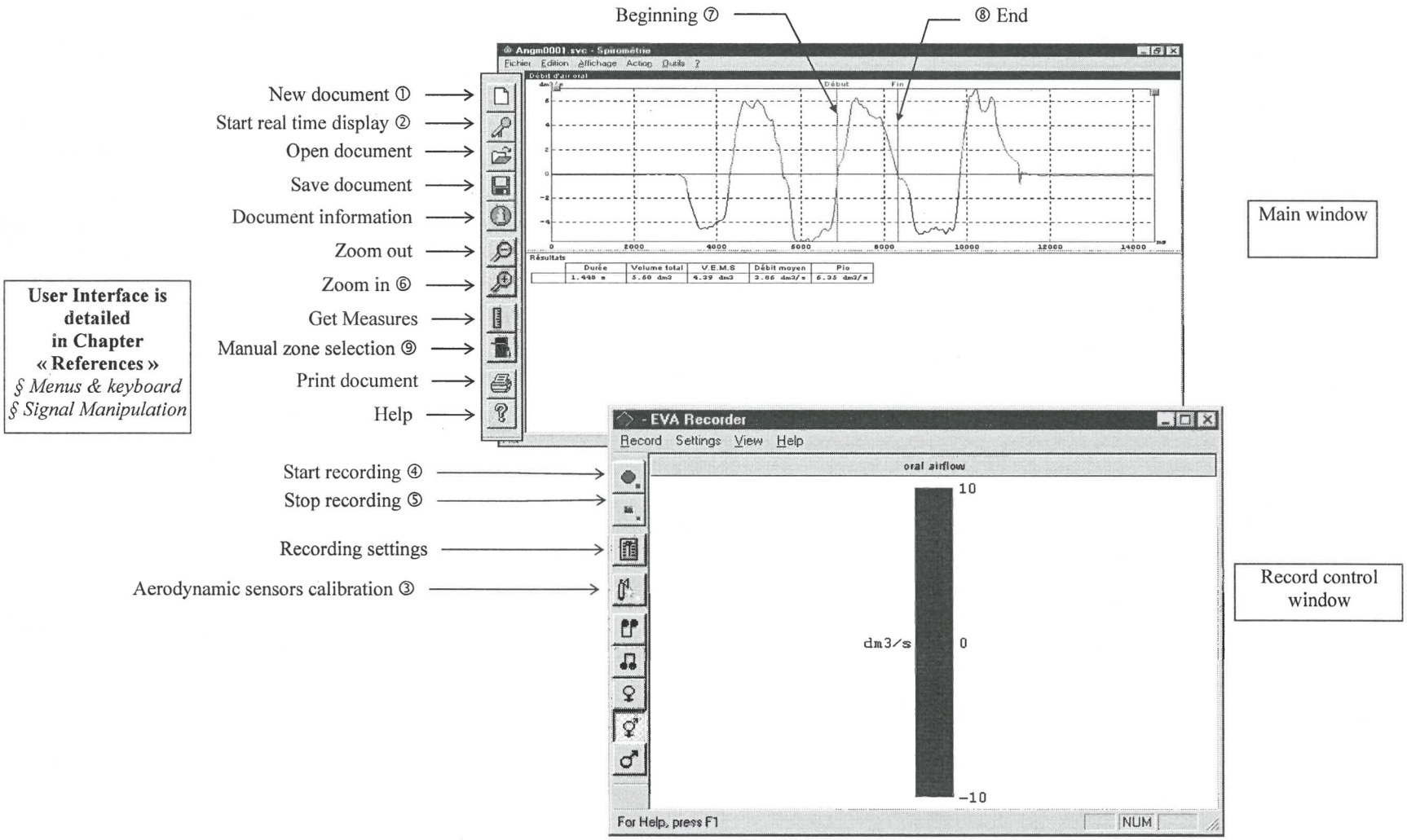
⑦ Replace the beginning of cycle cursor.

⑧ Replace the end of cycle cursor

⑨ It is possible to select manually the analysis zone:
- select a zone (place the mouse pointer at the beginning, press and hold down the Shift key and left mouse button as well, move the mouse to the end, release)
- push down the icon ⑨

- Save data
- print data
- remove and clean mask

Do not stretch too much the mask to avoid splitting the synthetic material.


Beginning ⑦
⑧ End
New document ①
Start real time display ②
Open document
Save document
Document information
Zoom out
Zoom in ⑥
Get Measures
Manual zone selection ⑨
Print document
Help
Main window
User Interface is detailed in Chapter « References »
§ Menus & keyboard
§ Signal Manipulation
- EVA Recorder
Record Settings View Help
oral airflow
10
dm3/s
0
-10
For Help, press F1
NUM
Start recording ④
Stop recording ⑤
Recording settings
Aerodynamic sensors calibration ③
Record control window

Measurement

Measurements are performed using two cursors defining the beginning and the end of a breathing cycle.

Creating and moving the observation cursors

Cursors defining the sentence appear automatically. Place the left cursor at the beginning of the sentence :

1. move the mouse pointer near the cursor,
2. click and hold down the left mouse button.
3. drag the mouse pointer at start of the signal.
4. release

Place the right cursor at the end of the sentence, using the same procedure.

One can also define manually an observation zone :

1. Create a selection zone (place the mouse cursor at the beginning, hold down the left mouse button, and the shift key at the same time, drag the mouse at the end of the selection, release)

   You can control the selection duration by looking the program state bar :

2. click on the icon
   or select the menu « *Action* | *Manual selection* »
   or use the « S » keyboard shortcut

Moving the observation cursors

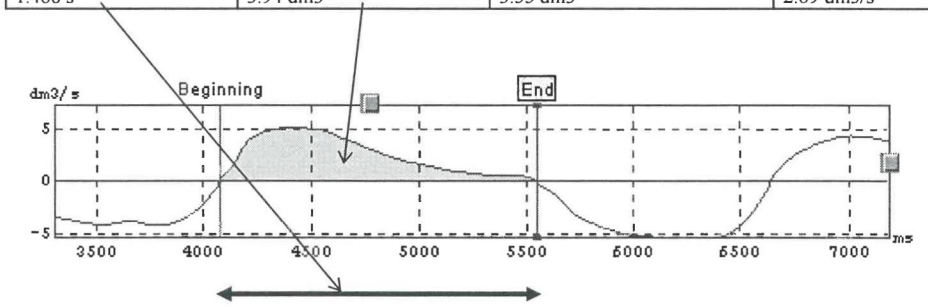
You can move these cursors if necessary.
To do so,

- place the mouse pointer near the cursor
- click and hold down the left mouse button
- move the mouse where you want
- release the left button

Results

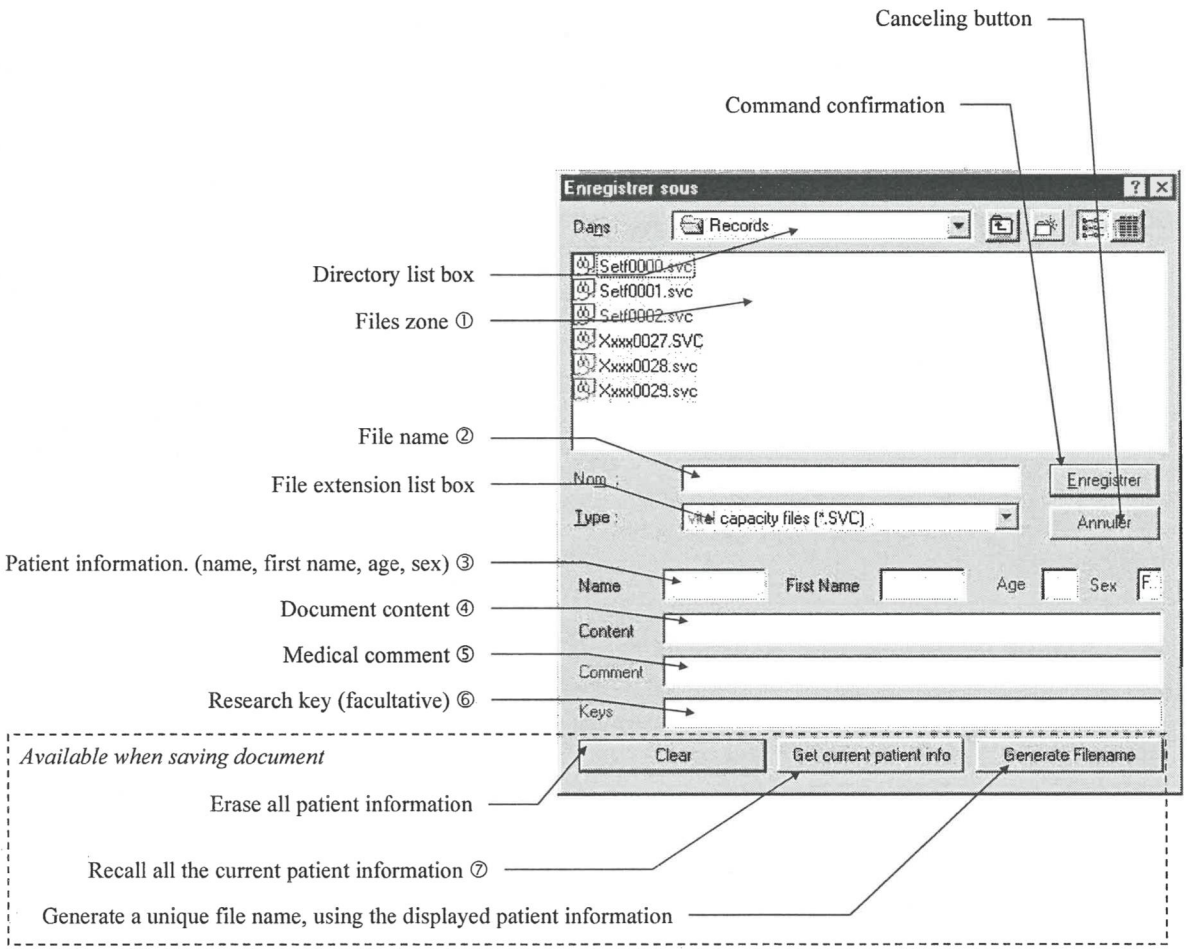
When the cursor placement is done, the results appear in an array :

duration between cursors	Volume between cursors	Volume exhaled on one second	Mean airflow rate
1.468 s	3.94 dm3	3.55 dm3	2.69 dm3/s



$$Quotient\ Phonatoire(dm^3 / s) = \frac{Volume\ Expiratoire(dm^3)}{Temps\ Maximal\ de\ Phonation(s)}$$

Data Management



Save a document

Method 1 : Click on ⑦. *The current patient information appear in the fields ③, ④, ⑤, ⑥. A unique filename is automatically generated in ②.* Confirm by clicking on ⑨.

Method 2 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Click on ⑧. *A unique filename appears in ②.* Confirm the saving by clicking on ⑨.

Method 3 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Enter a file name in ①. Confirm the saving by clicking on ⑨.

Open a document

Select a document in ① by a single click with the left mouse button.. *The file name appears in ② with its information as well in ③, ④, ⑤ ⑥.* Confirm your choice by clicking on ⑨.

To obtain information about the current document

Nasality

This program is made for evaluate the degree of congenital or established velar deficiencies by measuring the nasal leakage during a speech production. It allows to study the labials, apico-alveolar and lingo-palatal articulations by visualization of the oral airflow, and the velar articulations by visualization of the nasal airflow. This program is a useful tool for assessment of precocious dysarthria.

Principle

1. Recording of a sentence with or without predictable nasality :
   example : my aunt has sung this morning ⇔ predictable nasality
   that top goes too fast ⇔ no nasality

2. Visualization of the exhaled and inhaled airflow at the lips and nostrils. Computing of the volumes ratio nasal/volume expired in percentage on sentences containing occlusive and constrictive consonants.
3. Manipulator places two cursors at the beginning and end of the voiced part. Calculation is performed between these two cursors.

Preparation

Equipment

Place a disinfected mask on the mouthpiece. Choose a mask that will fit well with the patient face.

Do not stretch too much the mask to avoid splitting the synthetic material.

Place the nose tube. Verify that the nozzles are well fitted with the patient nostrils.
Turn the selector **INPUT 1-LEFT** on **MASK**.

Software

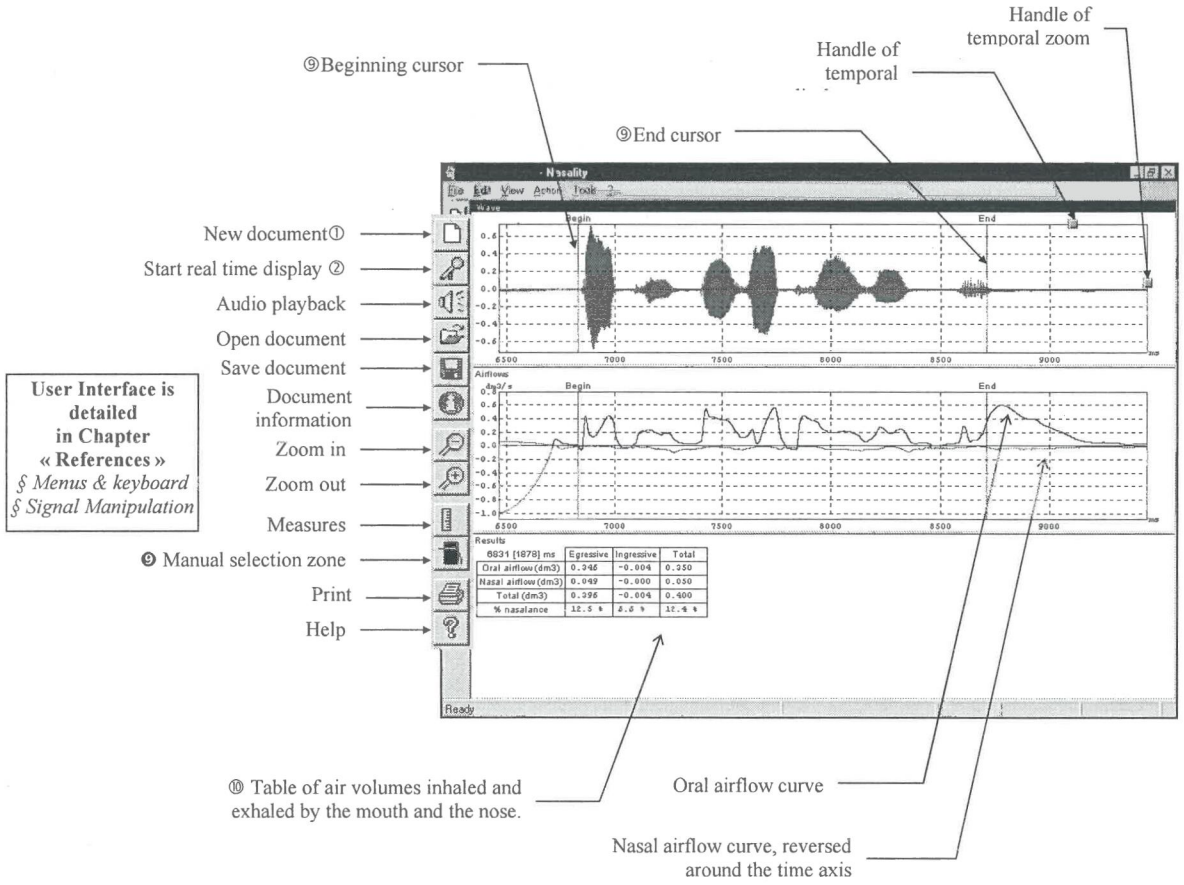
Launch the SESANE software by clicking this icon in Windows task bar.

In SESANE, enter the patient information :

Then double click on this icon :

Using Nasality

Main window



Protocol

① Create a new document if necessary
② Start real time display. *The record control window appears..*

Move away the patient from the mouthpiece.

③ Calibrate the sensors, wait three seconds. *The airflow level must be at zero.*
Replace the patient in position.
Verify that the patient is correctly pressed against the mask, and check that there is no air leakage between the nostrils and the nozzles.

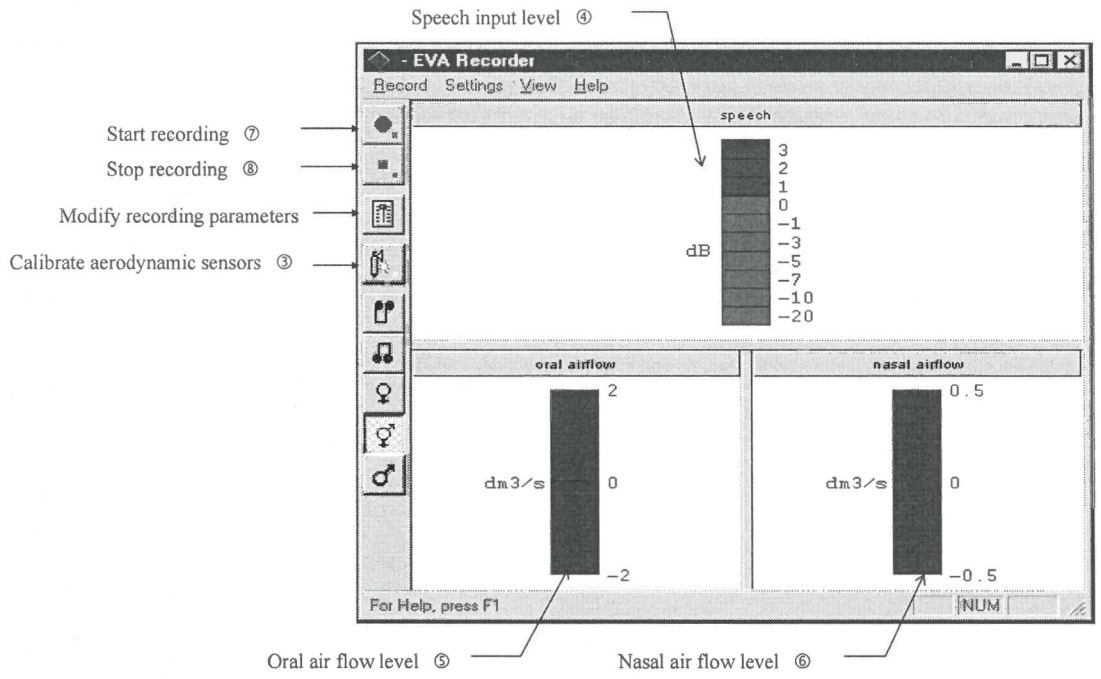
Patient pronounce the sentence for a try.

④ Verify the recording level of the acoustic input vu-meter. Beware of not reaching +3 dB while recording. If necessary, adjust the volume button of INPUT 1-LEFT. A low signal may indicate a bad position of the selector MASK - MICRO - LINE.

⑤ Verify that the oral air flow input level does not saturate during phonation. *In this case, the color bar graph turns yellow.*

⑥ Verify that the nasal air flow input level does not saturate during phonation. *In this case, the color bar graph turns yellow.*

Record control window



⑦ Start recording

The patient pronounce its sentence.

⑧ Stop recording. *The main window appears.*

Sentence delimiting cursors appear automatically. Look for the beginning and the end of the sentence. If needed use the zoom and movement handles or the zoom icons.

⑨*a)* Place the left cursor at the beginning of the sentence. To move this cursor, place the mouse pointer near the cursor, click and hold down the left mouse button, and move the mouse at start of the voiced signal.

⑨*b)* Place the right cursor at the end of the sentence.

❾ It is possible to select manually the analysis zone (see below):

- select a zone
- push down the icon ❾

⑩ Statistics appear immediately in the result chart.

Save the document.
Print the document.

Measurement

Measurements are performed using two cursors defining the beginning and the end of the test sentence.

Creating and moving the observation cursors

Cursors defining the sentence appear automatically. Place the left cursor at the beginning of the sentence :

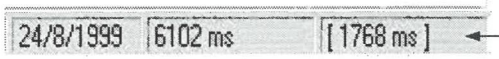
1. move the mouse pointer near the cursor,
2. click and hold down the left mouse button.
3. drag the mouse pointer at start of the signal.
4. release

Place the right cursor at the end of the sentence, using the same procedure.

One can also define manually an observation zone :

1. Create a selection zone (place the mouse cursor at the beginning, hold down the left mouse button, and the shift key at the same time, drag the mouse at the end of the selection, release)

   You can control the selection duration by looking the program state bar :



Selection duration

2. click on the icon
   or select the menu « *Action* | *Manual selection* »
   or use the « S » keyboard shortcut

Results

This program allows to compare the air volumes flowing through the mouth and the nostrils during the production of a type sentence. The different volumes are computed between two cursors located at the beginning et the end of a sentence. They are displayed in a recapitulative chart :

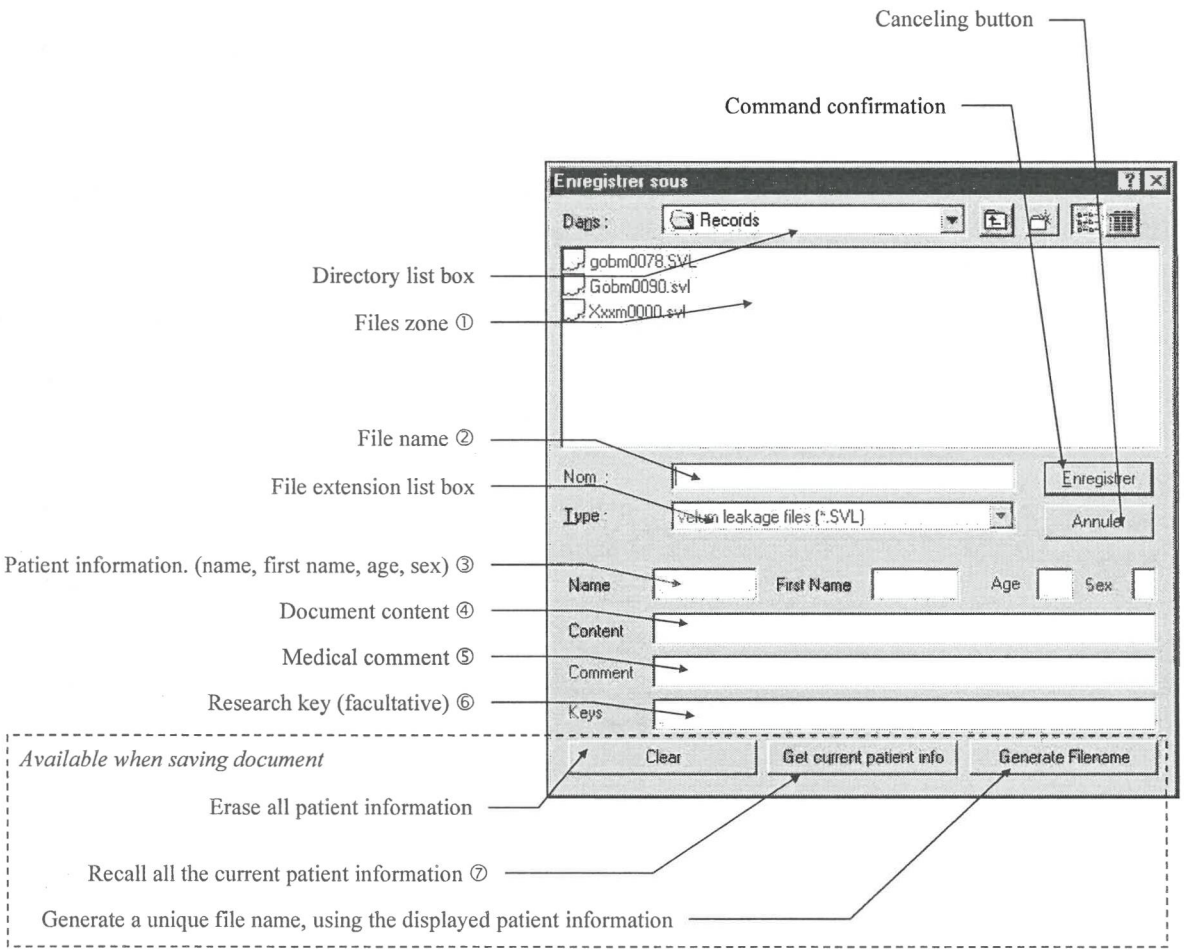
Egressive volumes column

Ingressive volumes column

6831 [1878] ms	Egressive	Ingressive	Total
Oral airflow (dm3)	0.346	-0.004	0.350
Nasal airflow (dm3)	0.049	-0.000	0.050
Total (dm3)	0.396	-0.004	0.400
% nasalance	12.5 %	6.6 %	12.4 %

Ratios Line between nasal volume and the nasal+oral volume

Data Management



Save a document

Method 1 : Click on ⑦. *The current patient information appear in the fields ③, ④, ⑤, ⑥. A unique filename is automatically generated in ②.* Confirm by clicking on ⑨.

Method 2 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Click on ⑧. *A unique filename appears in ②.* Confirm the saving by clicking on ⑨.

Method 3 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Enter a file name in ①. Confirm the saving by clicking on ⑨.

Open a document

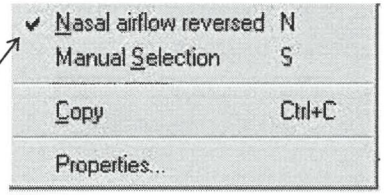
Select a document in ① by a single click with the left mouse button.. *The file name appears in ② with its information as well in ③, ④, ⑤ ⑥.* Confirm your choice by clicking on ⑨.

To obtain information about the current document

Options

By clicking the right mouse button on the air flow curves, this menu appears :

Allows to inverse or replace the nasal air flow curve around the time axis



Visualisation in mirror of the nasal curve is interesting because of its easy comparison with the oral airflow.

Notes

Normality

In normal phonation, without predictable nasality, the ratio between nasal volume and total volume exhaled must be inferior to 3%.

Electroglottography

Allows to obtain an image of the closure and opening of the vocal folds, by measuring the electrical resistance between two electrodes placed on either sides of the larynx.

Principle

Human tissue is a moderately good conductor of electricity. To a fair approximation, bodily structures behave like resistors for which Ohm's law is valid. That is, current through a given structure will be proportional to the applied voltage and inversely proportional to the net resistance.

Using two electrodes placed on either sides of the larynx and an appropriate material, one can measure the tissues resistance during phonation. Experimentation has indicated that the resistance sensed by the electroglottograph represents the surface area of contact of the vocal folds (membranous and cartilaginous).

The measured signal is composed of a fast modulation wave form, synchronous with the cycle of opening and closing of the vocal folds, and a slow modulation, revealing the larynx movements.

Preparation

Portable Laryngograph

- Plug off the transformer cable.
- Turn the selector on "Check" position to verify the battery level : if the vu-meter is not lighted on, recharge the battery
- Plug the electrodes cable extremity in the "Neck" socket. Place the two electrodes on either sides of the thyroid cartilage, so they are in maximal contact with the skin.
- Different sizes of neck bands are provided depending on the patient morphology.
- Once the electrodes are in place, turn the selector on "On" position. The patient speaks. The bar display must light on. If it is not the case, check the connection, the electrodes position, and the level selector (« Level ») which must not be on zero.
- Connect the cable between the Laryngograph rear panel (BNC socket) and the EVA 2 front panel **INPUT 2 - RIGHT**, Physio/E.G.G. connector. Turn the selector INPUT 2 on E.G.G.

EVA 2 Equipment

- Ensure that the recording level is sufficient on the INPUT 2 - RIGHT.
- Connect the on stand microphone to the MICRO plug of INPUT 1 - LEFT, and turn the input selector on MICRO.

Launch the software

Launch the SESANE software by clicking this icon in Windows task bar.

In SESANE, enter the patient information :

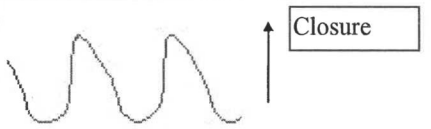
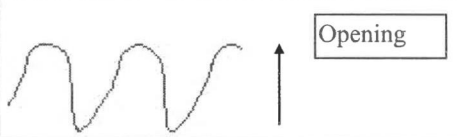
Then double click on this icon :

At the startup, a dialog box appears to configure the software.

Configuration

Preliminary

The waveform of the glottal cycle (called Lx) can be displayed in different ways. Upward movement of the curve can indicate more (1) or less (2) vocal fold contact.

• (1) closure	• or (2) opening
	

The waveform depends on :

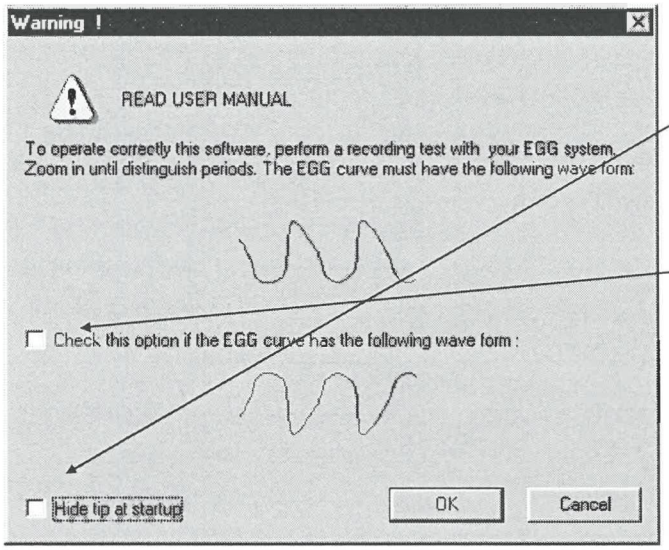
- E.G.G. equipment
- acquisition board (that can invert the sense of the signal)

To run correctly, the software must be configured so that upward movement of the Lx curve indicates closure.

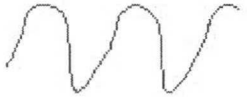
The waveform must look like as following :

Configuration sequence

At the startup, a dialog box appears to configure the software :


Warning !
READ USER MANUAL
To operate correctly this software, perform a recording test with your EGG system.
Zoom in until distinguish periods. The EGG curve must have the following wave form:
Check this option if the EGG curve has the following wave form :
Hide tip at startup
OK
Cancel

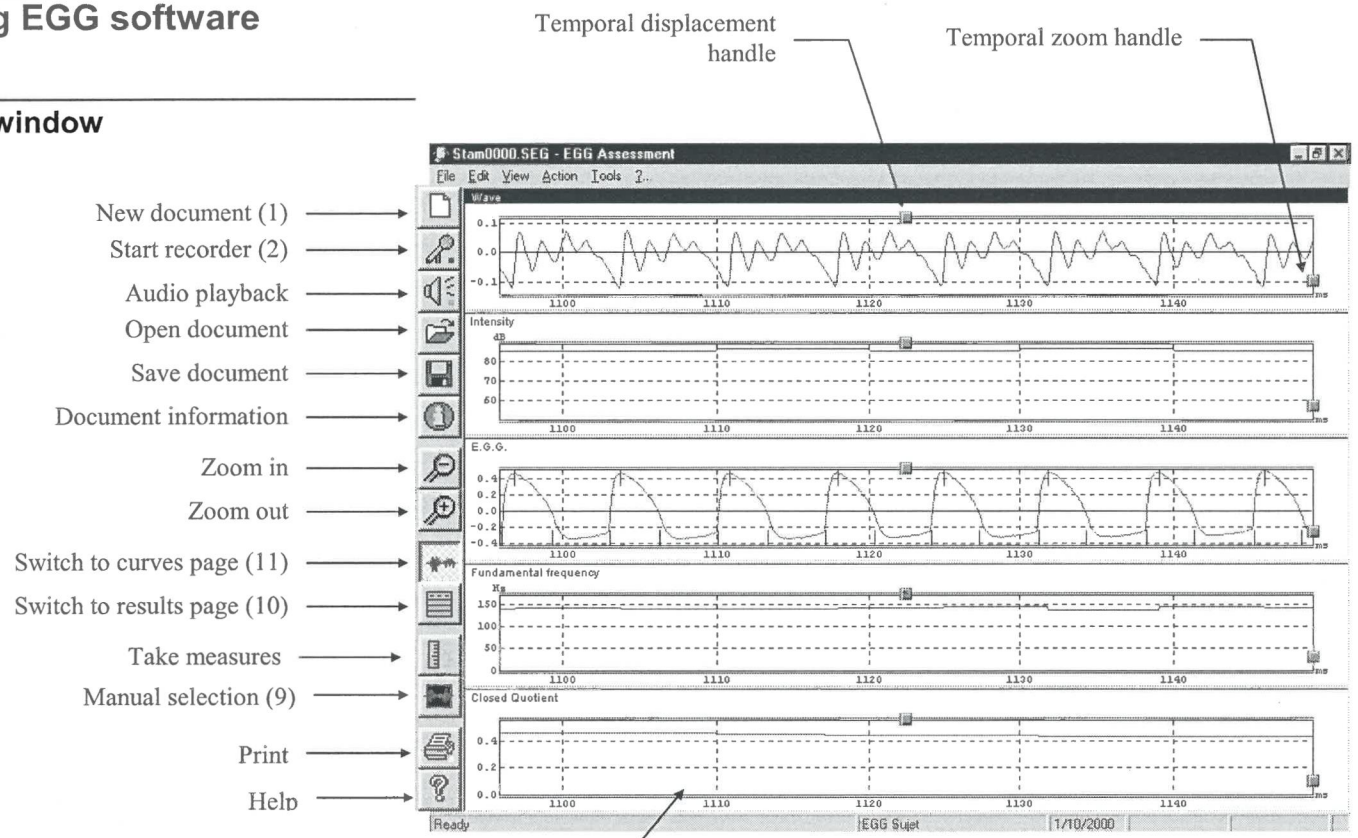
1. At the first startup, just click on « OK »
2. Let's record EGG signal on a « normal » subject (see below)
3. Zoom in so that you can distinguish glottal cycles.
4. If the waveform is similar to , the software is well configured.

   You will be able to check « Hide at startup » when the dialog box will appear again.
5. If the waveform is similar to  , the software is not correctly configured.

   - select the menu « Tools | Setting EGG phase »
   - check the option to invert the EGG phasis
   - go to step 2) again

Using EGG software

Main window



User Interface is detailed in Chapter « References »
§ Menus & keyboard
§ Signal Manipulation

Protocol

(1) Create a new document
(2) Start real time display.
The recording control window appears.

Make a try of a sustained « a » .

(3) Verify the recording level of the acoustic input vu-meter. Beware of not reaching +3 dB while recording. If necessary, adjust the volume button of INPUT 1-LEFT. A low signal may indicate a bad position of the selector MASK - MICRO - LINE.

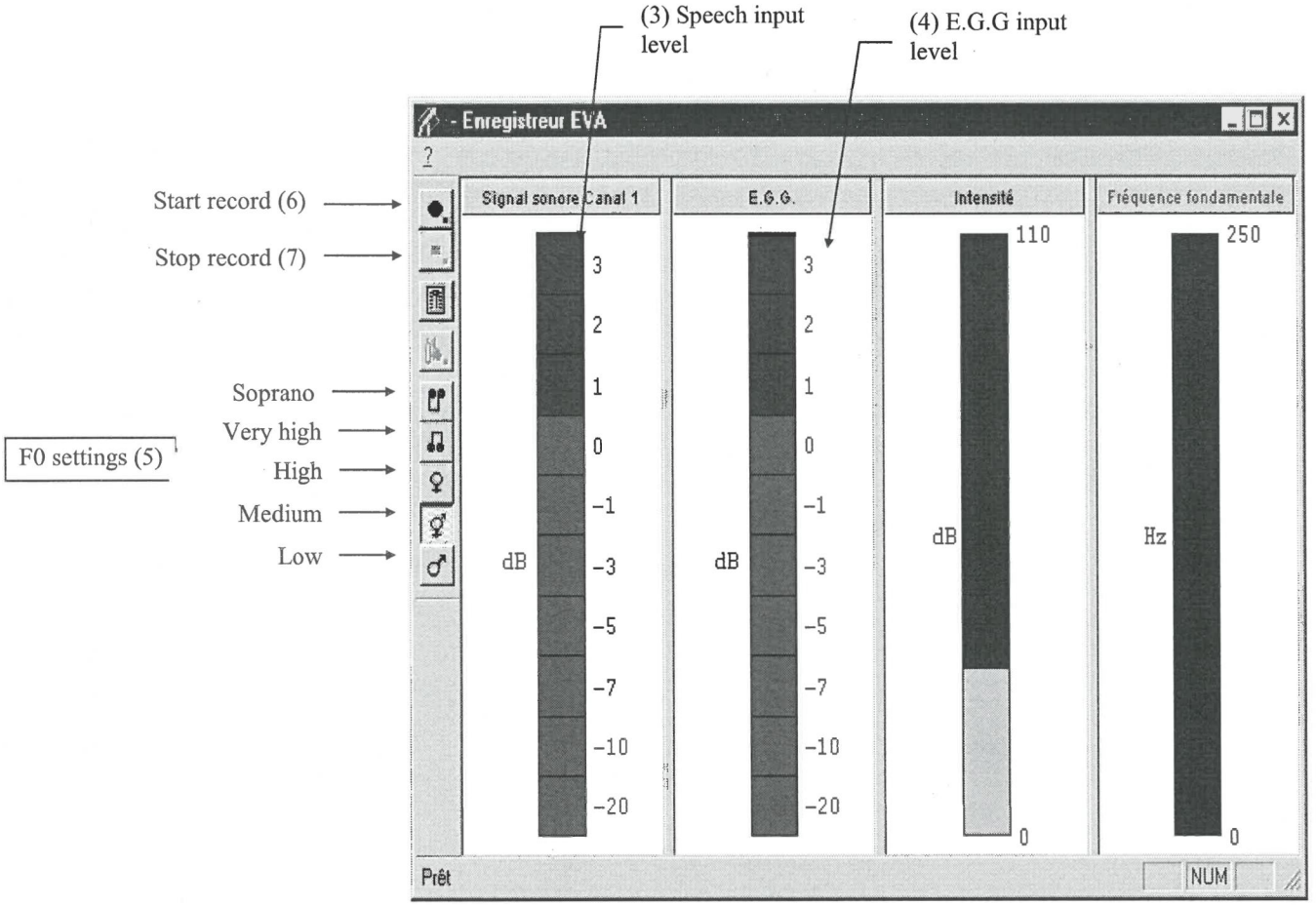
(4) Verify the recording level of the EGG input vu-meter. Beware of not reaching +3 dB while recording. If necessary, adjust the volume button of INPUT 2-RIGHT. A low signal may indicate a bad position of the selector LINE - MICRO - E.G.G.

(5) Set up the register of fundamental frequency depending on the patient tessitura.

(6) Start recording.

The patient produces a sustained « a » at comfortable and usual pitch.

Recording control window



(7) Stop recording

The main window appears

(8) The analysis zone appears automatically if a silent is present at the beginning and at the end.

(9) You can also set manually the boundaries. To do that,

- select a zone (place the mouse pointer at the beginning, press and hold down the Shift key + left mouse button, move the mouse until the end and release
- press the icon (9)

(10) The results appear in the result page.

(11) To display curves again

(12) You can move the analysis zone if necessary.
To move,

- place the mouse pointer near the cursor
- click and hold down the left mouse button
- move the mouse where you want
- release the left button.

Save the document.
Print the document.

Measurement

EGG assessment is performed on an observation zone chosen on the recorded signal.

Observation zone creation

The observation zone appears automatically if a silent is present at the beginning and at the end of the utterance. This zone starts at the end of the initial silence and finishes at the beginning of the final silence.

You can also define manually this zone. All the analysis will be computed again.

To define manually a zone :

1. select a part of signal (place the mouse pointer at the beginning, press and hold down the Shift key + left mouse button, move the mouse until the end and release).
   You can control the length of your selection by watching in the status bar.

2. click on the icon of zone transformation :
   or select the menu « *Action* | *Manual Selection* »
   or use the keyboard accelerator « S »

The analysis zone is enlarged to the size of the selected zone, and the statistics are immediately performed.

To define automatically the observation zone :
select the menu « *Action* | *Automatic Boundaries*»
or use the keyboard accelerator « A »

Observation zone placement

To move the observation zone :
1. place the mouse pointer near the left edge of the zone cursor,
2. click the left mouse button and maintain it down,
3. move the analysis zone,
4. release

Results display

Results are displayed in statistics page which contains numerical and graphical results. To switch between these pages use these icons :

Signals : Statistics :

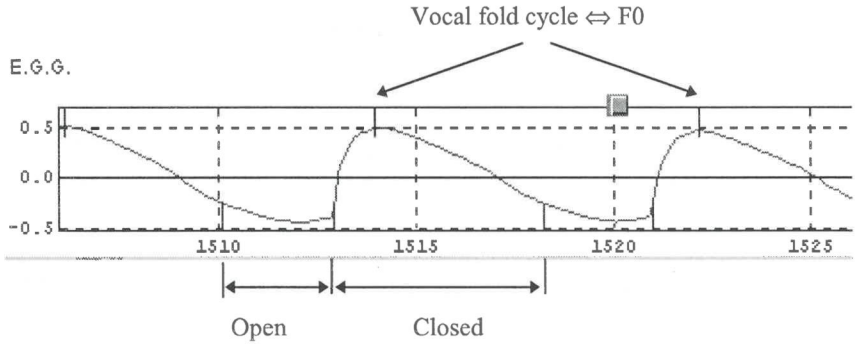
You can also change the current page by
- selecting the menu « View | Switch to xxx page »
- OR by using the keyboard accelerators « 1 », « 2 »

Signals page

E.G.G. curve (Lx)

Upward movement of the curve indicates more (vocal fold contact (closure) if the software is well configured (cf. Configuration, p. 2).

If you zoom enough, you can see vocal folds cycles, opening and closure.

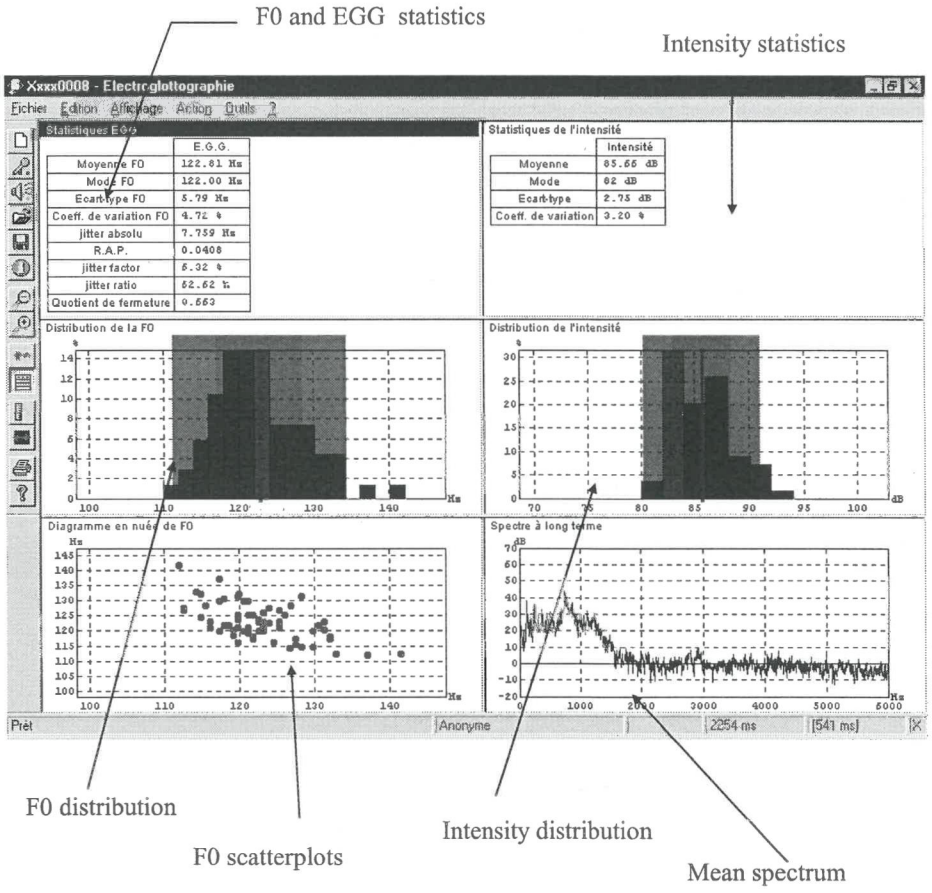


Closed quotient curve

This curve displays the closed quotient value for each vocal fold cycle (cf. p.12)
This measurement is interesting to assess hypoadduction (quotient < 0.4) or hyperadutcion (quotient > 0.6)

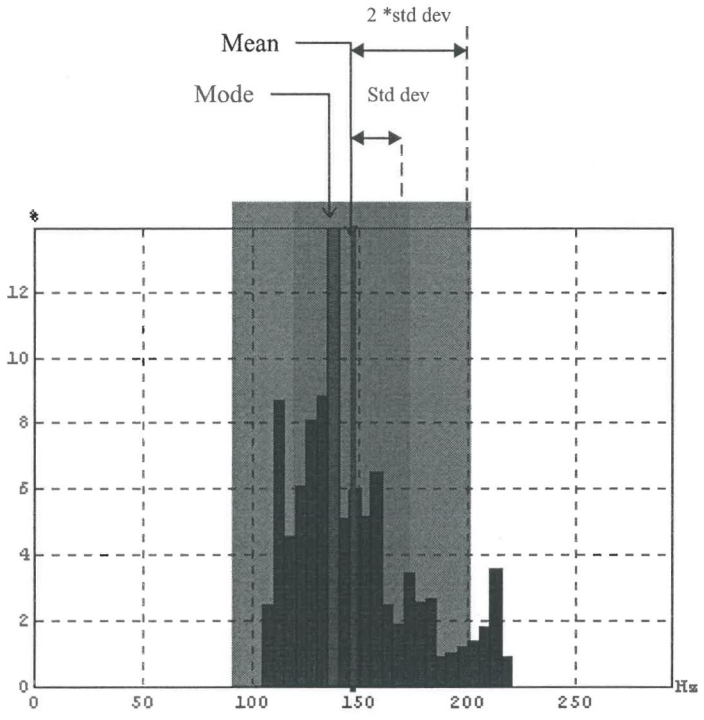
Results page

The program displays the mean, standard deviation, and coefficient of variation in percentage for each type of recorded signal.



Distributions

Blue line ⇔ Mean
Modal class ⇔ red bar
Light green ⇔ standard deviation
Dark green ⇔ 2x standard deviation

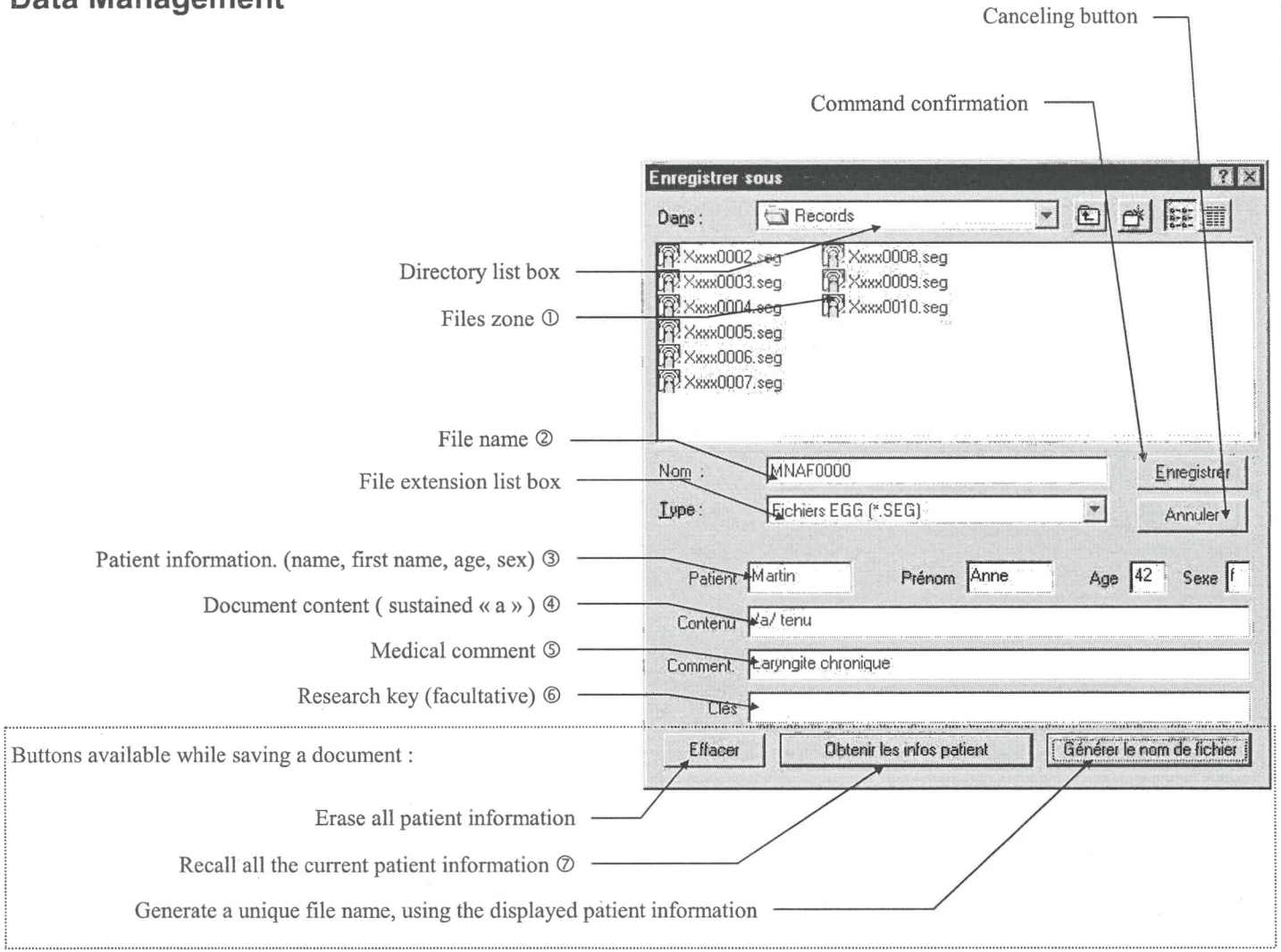


A reticule is available to take measure (just click on the distribution graph and move the mouse holding down the left mouse button) .

Results in arrays and scatterplots

See details in technical notes of « Voice Profile » application

Data Management



Save a document

Method 1 : Click on ⑦. *The current patient information appear in the fields ③, ④, ⑤, ⑥. A unique filename is automatically generated in ②.* Confirm by clicking on ⑨.

Method 2 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Click on ⑧. *A unique filename appears in ②.* Confirm the saving by clicking on ⑨.

Method 3 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Enter a file name in ①. Confirm the saving by clicking on ⑨.

Open a document

Select a document in ① by a single click with the left mouse button.. *The file name appears in ② with its information as well in ③, ④, ⑤ ⑥.* Confirm your choice by clicking on ⑨.

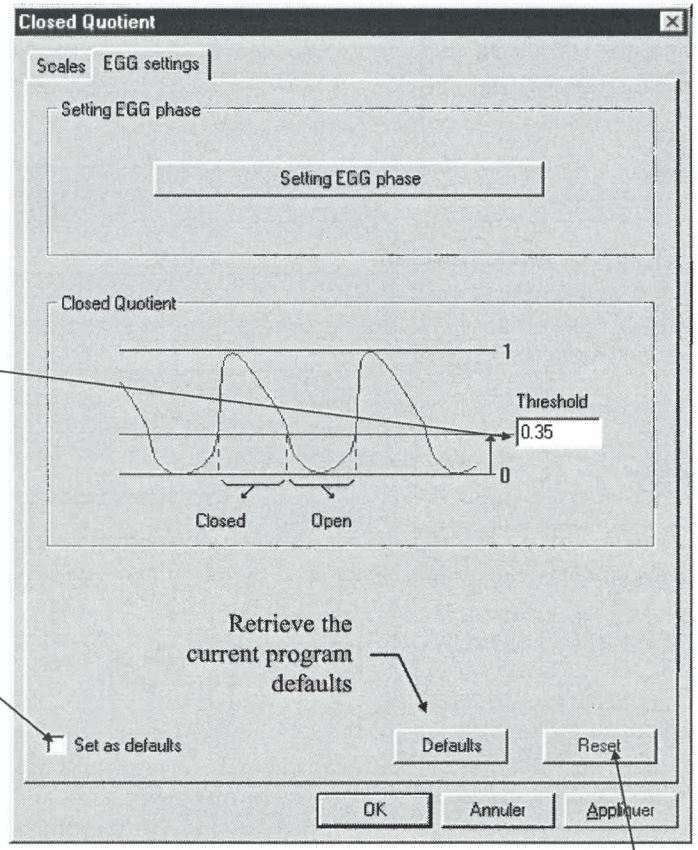
To obtain information about the current document

Options

You can modify the program parameters by selecting the menu « Tools | Options » or by typing the « O » key.

Threshold used by closed quotient

To change the threshold (cf. p.12)



Set the changes as new program default

Retrieve the factory defaults

Technical Notes

Portable Laryngograph

The battery in the Laryngograph will give 24 hours of continuous use. To power it again, use the charger furnished, and insert its small plug into the left socket of the back panel. **The right selector of the front panel should be OFF during charging.** Charging takes about 14 hours when the battery is initially completely flat.

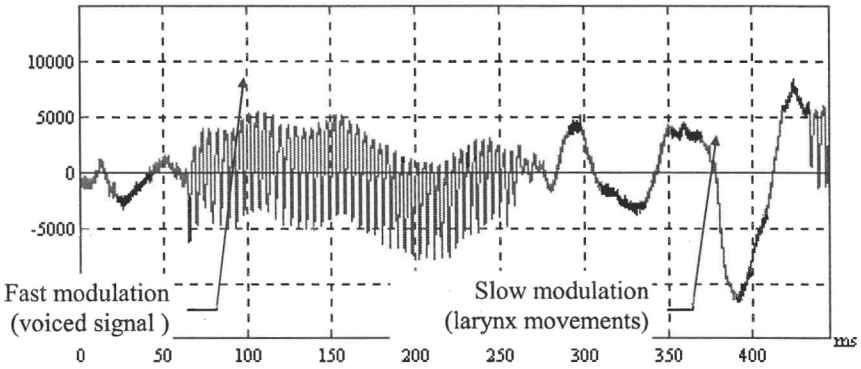
Results

See details in technical notes of « Voice Profile » application

EGG signal

EGG signal is composed of :

- a high-frequency component which is relative to vocal folds vibration (voice)
- a low-frequency component which is relative to low movement of larynx (ex : swallowing).

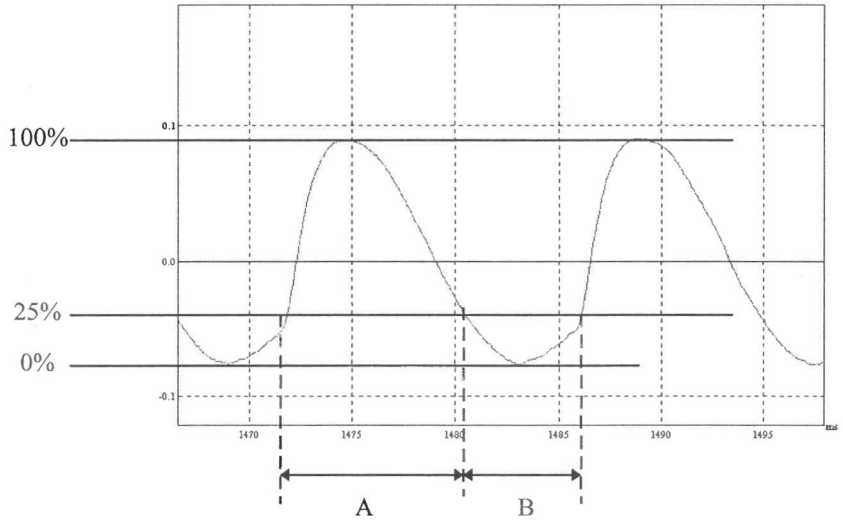


EGG signal quality is highly dependent from the good application of the electrodes. Take care to have a good positioning.

The amplitude of the EGG signal depends from this positioning and brings only a relative information for a record. In other words, a different dynamic between two records does not implies a different vibratory behavior.

Closed quotient method

This protocol is based on experiences realized by Scherer, Vail et Rockwell (1993), « Examination of the laryngeal Adduction Measure EGGW », NCVS status and Progress Report, 73-82. It consist in measuring the ratio between the closed phase and the complete cycle.



Quotient = A / (A +B)

The 25% threshold is proposed by the authors. It can be modified by clicking the right mouse button and selecting the « Properties » menu. A dialog box allows to set the threshold in percentage. To keep this value as default, use the button « Keep As default setting ».

Normality

With a threshold = 25-35%

0	0.4	Closed quotient	0.6	1
Hypoaduction		Normal		Hyperaduction

References

Technical Characteristics

Signal	Sampling freq.	Resolution	max. tension in output	Sources
Acoustic #1	25 kHz	16 bits	+/- 10V	Microphones, tape player, DAT,
Acoustic #2	25 kHz	16 bits	+/- 10V	Microphone, tape player, DAT, E.G.G
Oral airflow	6.25 kHz	16 bits	+/- 10V	Sensors
Nasal airflow	6.25 kHz	16 bits	+/- 10V	Sensors
Pressure #1	6.25 kHz	16 bits	+/- 10V	Sensors
Pressure #2	6.25 kHz	16 bits	+/- 10V	Sensors
Auxiliary input	6.25 kHz	16 bits	+/- 10V	EMG, ...

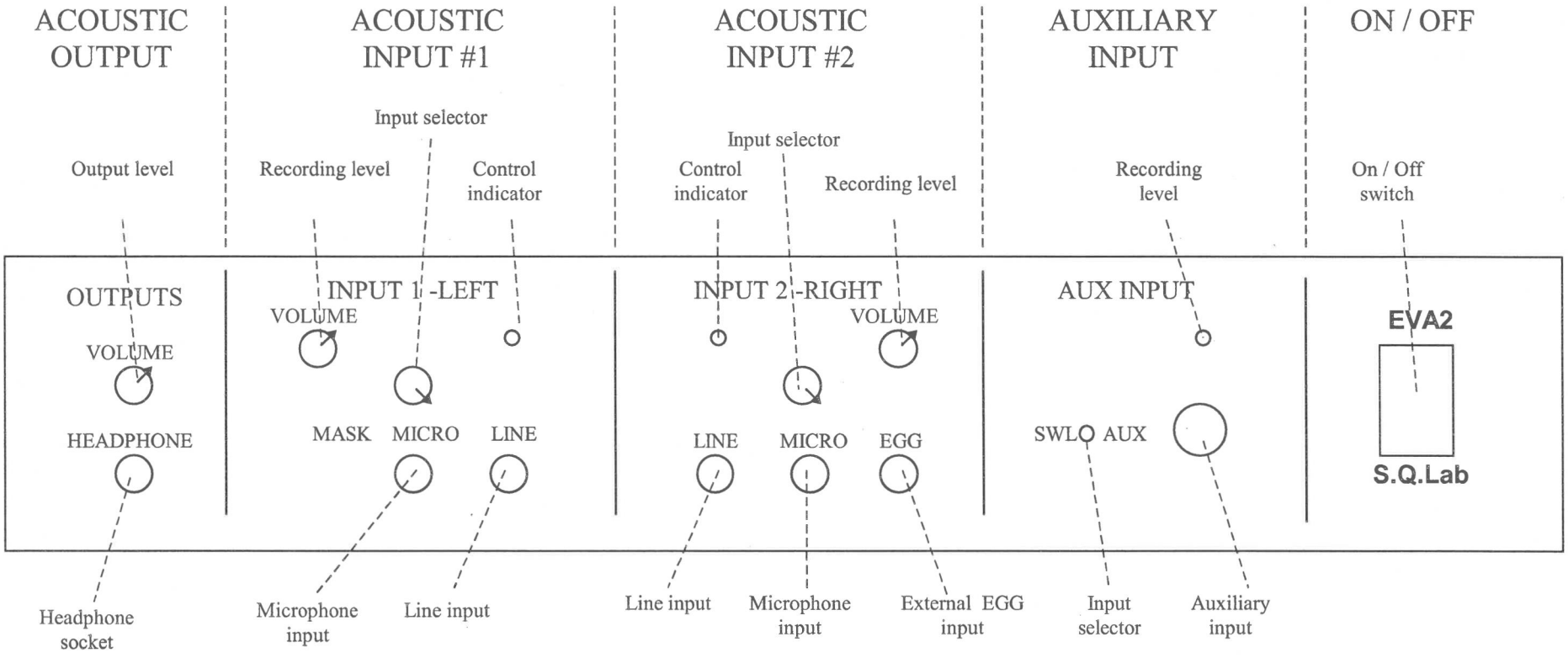
Accessories	Model	Description	Characteristics
Microphone of the mouthpiece	AKG C419	prepolarized condenser, hypercardioïd	20-20000Hz, Max sound pressure level 126 dB, phantom powering*
Microphone	STATEX TOA PRIMO	capsule electret, cardioïd	20-20000Hz, Max sound pressure level 138 dB, phantom powering*
Microphone	AKG C 1000S	prepolarized condenser, hypercardioïd	50-20000Hz, Max sound pressure level 137 dB, phantom powering*

* phantom powering integrated in EVA. Requires battery if used with other equipment

General presentation of the interface

Most of the operations (power on, settings, input selection) are performed from the front panel of the interface. It is composed by 5 parts :

- Acoustic outputs " OUTPUTS " for the audio playback
- Acoustic input #1 " INPUT 1 - LEFT " for the recording of sound signal.
- Acoustic input #2 " INPUT 2 - RIGHT" for the recording of sound signal or EGG.
- Auxiliary input " AUX INPUT " for the recording of an auxiliary input like EMG,...
- ON / OFF switch


ACOUSTIC OUTPUT
ACOUSTIC INPUT #1
ACOUSTIC INPUT #2
AUXILIARY INPUT
ON / OFF
Output level
Recording level
Input selector
Control indicator
Control indicator
Input selector
Recording level
Recording level
On / Off switch
OUTPUTS
VOLUME
HEADPHONE
INPUT 1 -LEFT
VOLUME
MASK
MICRO
LINE
INPUT 2 -RIGHT
VOLUME
LINE
MICRO
EGG
AUX INPUT
SWLO
AUX
EVA2
S.Q.Lab
Headphone socket
Microphone input
Line input
Line input
Microphone input
External EGG input
Input selector
Auxiliary input

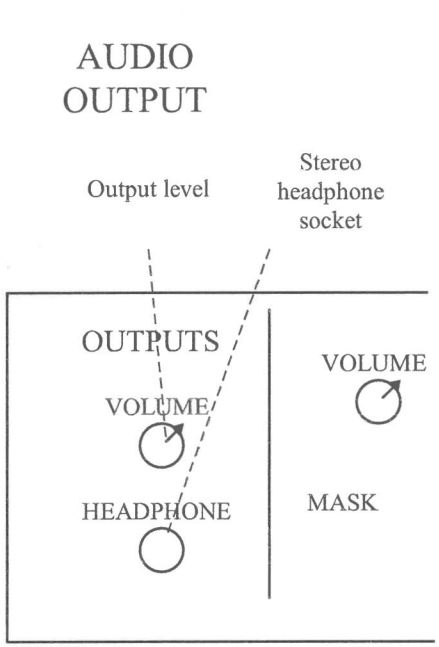
front panel

Power switch

To switch on/off the equipment, use the power switch on the right side of the front panel

Audio playback

This part manage the audio playback and the recording on magnetic tapes.



Loudspeaker :

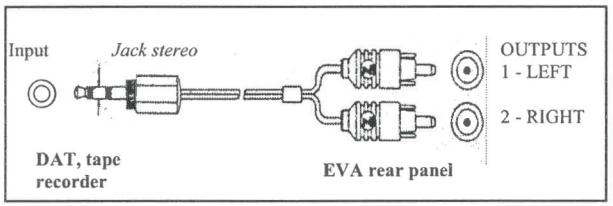
Connect the loudspeaker on the **OUTPUTS - 1 LEFT** jack socket on the rear panel

do not connect the loudspeaker to the headphone input on the front panel

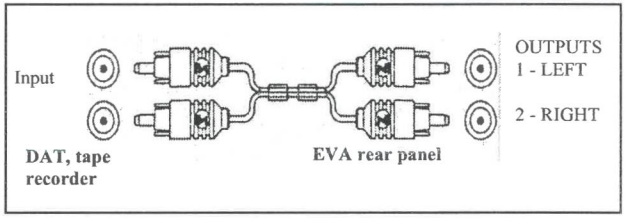
Note : Connecting the headphone, cuts automatically the loudspeaker output.

Lines outputs :

The EVA line outputs, located on the back panel allow to record on audio tapes the sound signals stored in the computer. To do so, just connect the EVA line outputs to the tape recorder or DAT inputs, launch an audio playback from the computer, and start the recording on the tape recorder.

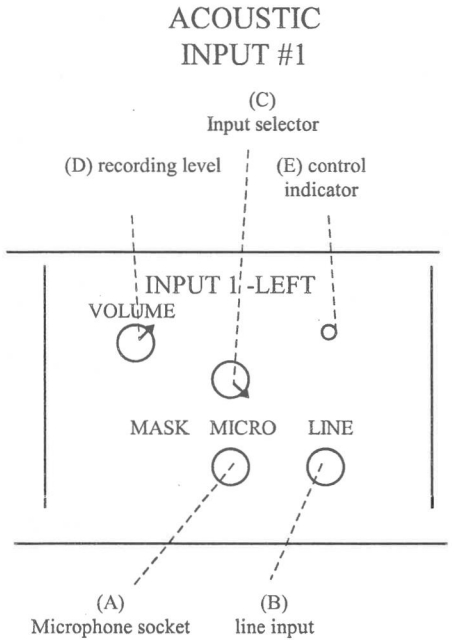


or



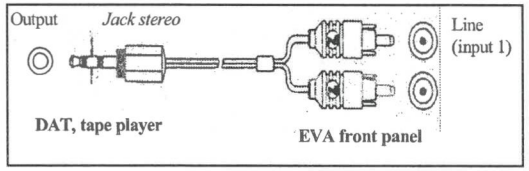
Acoustic input #1

This part allows to record sound with channel #1 (" Left Input ").

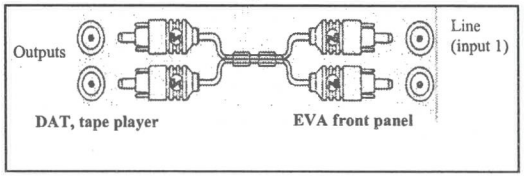


A : Socket for connecting an electrodynamic or electrostatic microphone (integrated phantom powering).

B : Line input for connecting a tape player or a DAT



or



C : To choose the acoustic source between :

- mouthpiece microphone (position " MASK ")
- on stand microphone (position " MICRO ")
- line input (position " LINE ")

D : To set the sound input level

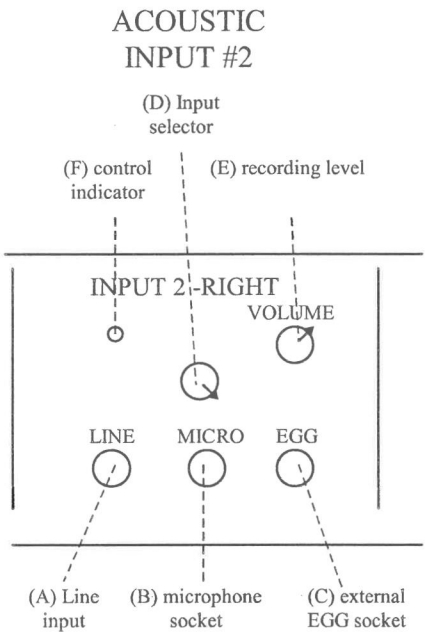
E : To verify if an acoustic signal is recorded. The indicator stays off when :

⇒ the input selector is in a bad position. (ex : selector on " LINE " while the on-stand microphone is used)

⇒ input level is too low

Acoustic input #2

This part allows to record sound with channel #2 (" Right input ").



A : Line input for connecting a tape player or a DAT

B : Socket for connecting an electrodynamic or electrostatic microphone (integrated phantom powering).

C : Socket for an external Electro-glottograph connection

D : To choose the acoustic source between :

- line input (position " LINE ")
- on stand microphone (position " MICRO ")
- external Electro-glottograph (position EGG)

E : To set the sound input level

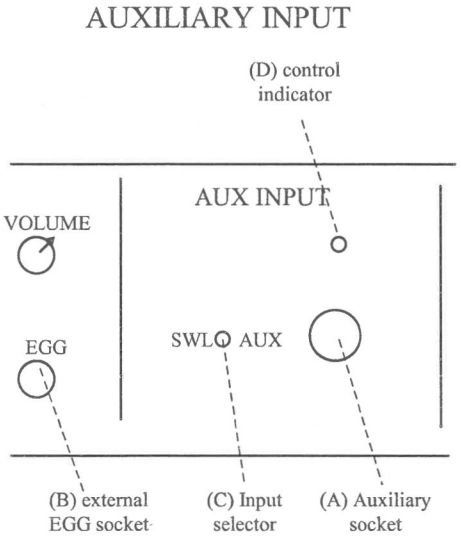
F : To verify if an acoustic signal is recorded. The indicator stays off when :

⇒ the input selector is in a bad position. (ex : selector on " LINE " while the EGG is used)

⇒ input level is too low

Auxiliary input

Allow to record an auxiliary signal.



A : Auxiliary input for connecting an external equipment.

B : Socket for an external electroglottograph connection.

C : To choose an input source between :

- auxiliary input (position " AUX ") to get a signal from an external equipment
- swallowing signal (position " SWL ") to catch the low frequency signal pour of the electroglottograph connected to the acoustic input #2.

D : To verify if an acoustic signal is kept. The indicator stays off when :

⇒ the input selector is in a bad position.

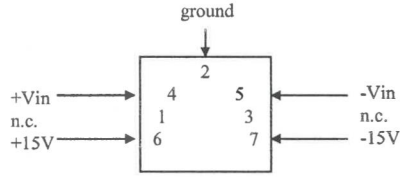
⇒ input level is too low

Auxiliary input :

The auxiliary output allows to get a signal coming from an external device (EMG, other electronic sensors...). Moreover, it is able to supply electric power supply if this device requires it. The socket on the auxiliary input is a 5 pins DIN female. Connection is described on left. Auxiliary input is differential (+Vin et -Vin) to get the signal, and supplies +15V/ -15V power, and ground.

Specifications :

- maximal current : 50mA



Auxiliary socket shown from the user side

Aerodynamic sensors

The aerodynamic measures are recorded with the mouthpiece. All the settings concerning the offset zeroing and the choice of scales are performed by the computer. However, to record sound from the mouthpiece, it is necessary to turn the **INPUT-1 LEFT** selector on **MASK** position.

- Do not open the mouthpiece
- Do not dismantle the grids of the airflow ducts

Mask and tubes are disinfected but not sterilized.

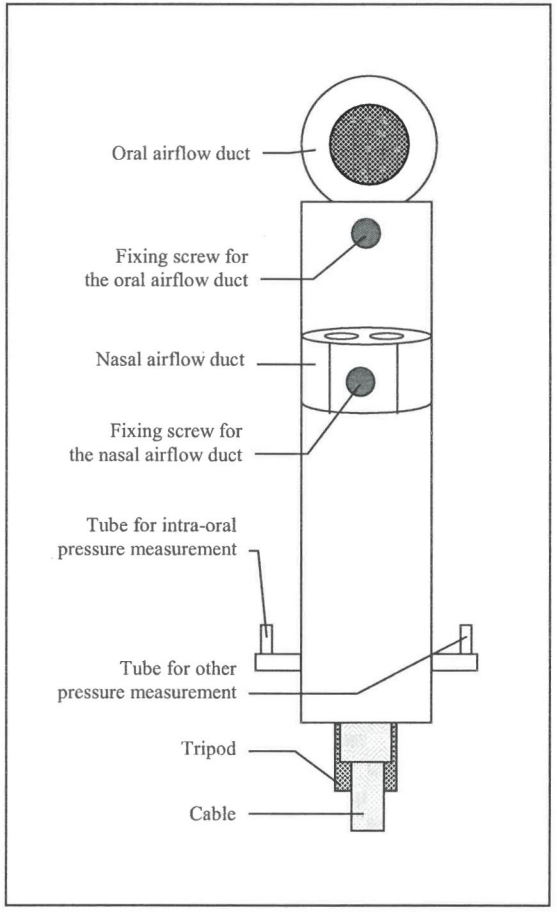
Air flow sensors

Airflow sensors are build with grid pneumotachographs, realized for giving a wide dynamic, a small dead volume for a large frequency response and a good linearity for all the articulatory and respiratory contexts. Their resistance to the flow is about 10 Pa for an airflow rate of 1 l/s, which represents a range of $1/100^{th}$ of a standard subglottic pressure (around 10 hPa).

Pressure sensors

Pressure sensors have these characteristics :

- piezoresistif bridge
- heat and gravity compensation
- response time : 0.1 ms
- linearity (typical : 0.01%, max. : 0.1%)
- damage pressure : 1900 hPa


Oral airflow duct
Fixing screw for the oral airflow duct
Nasal airflow duct
Fixing screw for the nasal airflow duct
Tube for intra-oral pressure measurement
Tube for other pressure measurement
Tripod
Cable

Mouthpiece Schema

Menus and keyboard Accelerators

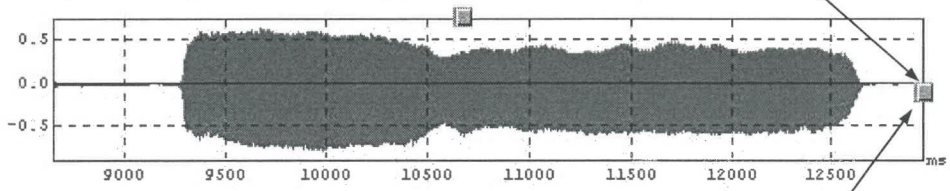
Menu	Keyboard Accelerator	Toolbar	Action
File | New	Ctrl N		Create a new document
File | Open	Ctrl O		Open an existing document
File | Save	Ctrl S		Save the active document
File | Information	Ctrl I		Patient information
File | Start Recorder	R		Start real time recorder
File | Playback	P		Start or stop playback
File | Print	Ctrl P		Print the active document
Edit | Copy	Ctrl C		Copy the selected graph or array and put it in the clipboard
View | Zoom out	-		More general View (horizontal axis)
View | Zoom in	+		More precise View (horizontal axis)
View | Full Page	*		Full page view (horizontal axis)
View | Move Left	←		Move the view to the left
View | Move Right	→		Move the view to the right
View | Scale out	Ctrl -		More general View (vertical axis)
View | Scale in	Ctrl +		More precise View (vertical axis)
View | Full Scale	Ctrl *		Automatic vertical scale
View | Move Up	↑		Move up the selected graph
View | Move down	↓		Move down the selected graph
Action | Measures	M		Call or hide the measure cursor
Tools | Options	O		Software options

Signal Manipulation

Horizontal Zoom

To display a more precise view along the horizontal axis :

- click on Zoom In Icon
- or use zoom handle
- or choose the Menu View | *Zoom in*
- or press the keyboard accelerator [+]



To display a more general view along the horizontal axis :

- click on Zoom Out Icon
- or use zoom handle
- or choose the Menu View | *Zoom out*
- or press the keyboard accelerator [-]

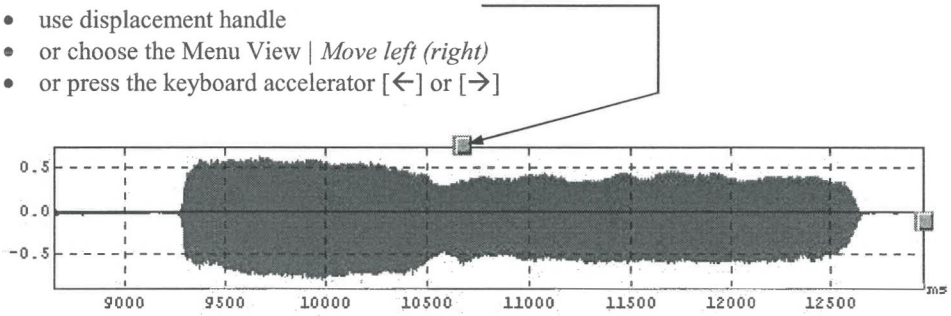
To display the complete view along the horizontal axis :

- move up the zoom handle
- or choose the Menu View | *Full page*
- or press the keyboard accelerator [*]

Horizontal displacement

If the view has been zoomed in, you can move along the horizontal axis :

- use displacement handle
- or choose the Menu View | *Move left (right)*
- or press the keyboard accelerator [←] or [→]



You can also move temporally the signal by using a drag (click on the signal, maintain the left mouse button down and move the mouse horizontally).

Saving view

If you are satisfied by the present view and you want to keep the settings, save the document :

- click on
- or choose the Menu *File* | *Save*
- or press the keyboard accelerator Ctrl [S]

Vertical zoom

To display a more precise view along the vertical axis :

- put the focus on the signal
- choose the Menu View | *Scale in*
- or press the keyboard accelerator Ctrl [+]

To display a more general view along the vertical axis :

- put the focus on the signal
- choose the Menu View | *Scale Out*
- or press the keyboard accelerator Ctrl [-]

To display the signal with automatic scales :

- put the focus on the signal
- choose the Menu View | *Full Scale*
- or press the keyboard accelerator Ctrl [*]

Vertical displacement

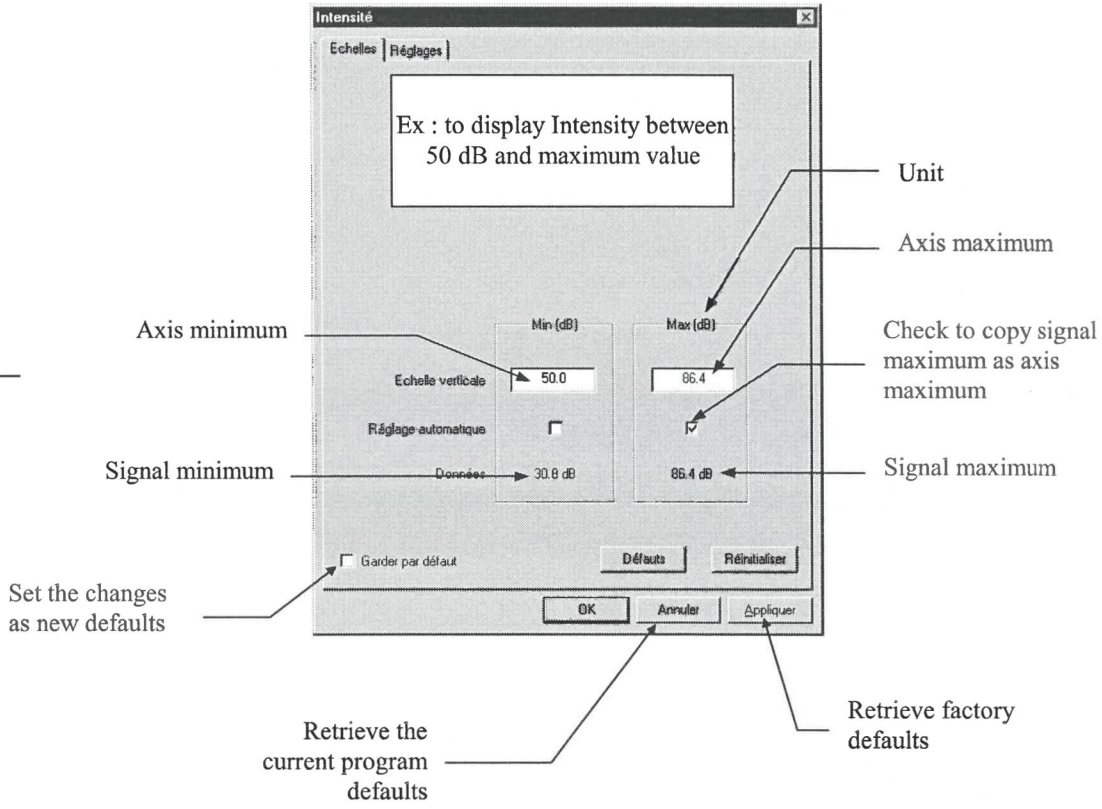
You can move along the vertical axis :

- put the focus on the signal
- choose the Menu View | *Move Up (Down)*
- or press the keyboard accelerator [↑] or [↓]

Setting scales

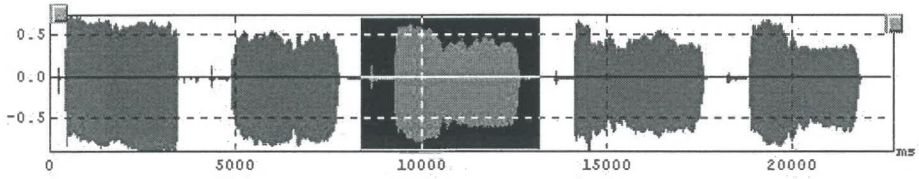
To change precisely scales:

- put the focus on the signal
- call Properties Menu (mouse right button)
- select Scales Page

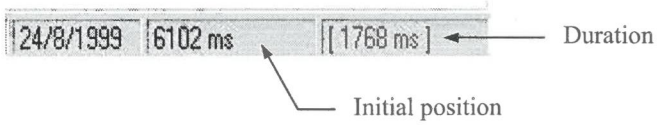


Selection of a part of signal

Move the mouse pointer on a signal window. Hold down the « shift » key. Click simultaneously the left mouse key, and move along the signal. The selected signal appears in reversed colour inside a black zone.



To check selection position and duration, use information displayed in the status bar:



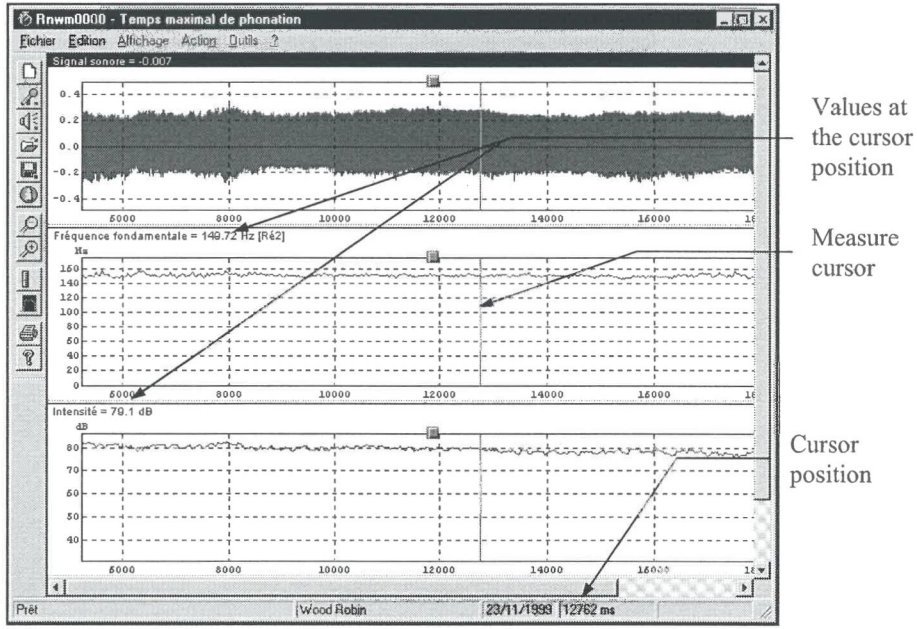
You can listen to the selected part by clicking on this icon

You can zoom on this signal

- by clicking on this icon
- or by choosing the Menu View | *Zoom In*
- or by pressing the keyboard accelerator Ctrl [+]

Measurement

Select the measuring icon . The measure cursor appears. Select this cursor and move it (maintain the left mouse button while moving). The temporal position and the signal values appear.



To hide the cursor, click again on .

WARNING

INSTRUCTIONS FOR SAFETY AND USE

This equipment must be used only by qualified staff. Users must be warned about the danger.

Please read this manual carefully before using the appliance.

S.Q.Lab will not be liable to any defect, failure or damage caused by improper use or improper or inadequate maintenance or care.

S.Q.Lab will not be liable for any indirect, special , incidental or consequential damages irrespective of whether SQLAb has advance notice of the possibility of such damages

EVA workstation has been developed in collaboration with the CNRS Laboratory « Speech et Language » from the University of Provence in Aix-en-Provence (Bernard Teston).

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Laboratoire « Parole et Langage »
Université d'Aix-Marseille
5, avenue Pasteur
13 100 Aix-en-Provence, France

WARRANTY

SQLab warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, SQLab, at its option, either will repair the defective product without charge for parts and labour, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify SQLab of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service centre designed by SQLab., with shipping charges prepaid. SQLab shall pay for the return of the product to Customer if the shipment is to a location within the country in which the SQLab service centre is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance or care. SQLab shall not be obligated to furnish service under this warranty

- to repair damage resulting from attempts by personnel other than SQLab representatives to install, repair or service the product
- to repair damage resulting from improper use or connection to incompatible equipment
- to service a product that has been modified

S.Q.Lab.
BP 40 282
13 798 Aix-en-Provence Cedex 3, France

Internet : www.sqlab.fr

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Suggestions for safety

Learn general instructions for safety to avoid injury and risk of equipment deterioration. To avoid potential danger, use the equipment only as it should be used.

Installation, maintenance and repair must be done only by qualified staff.

Cautions against injury and fire risk

Use only an appropriate Mains connection cable. Use only the specified cable with this equipment and certified for the country.

Earth the equipment. This equipment has an electrical plug with 2 wires + earth, with regards to the medical standards. It is earthed through the connection cable. To avoid electrostatic discharge, the ground conductor wire must be earthed. Before use, check this connection.

Do not use the equipment without its covers.

Connect and disconnect the equipment correctly. Switch off the equipment before connecting or disconnecting the connection between the interface and the mouthpiece, the interface and the computer...

Use only correct fuses. (fuse type and value).

Place the unit where it will be well ventilated. Do not place the equipment in a closed compartment.

Do not use the equipment in case of possible failure. If you think that the equipment has a problem, ask qualified staff to check.

Do not use the equipment in a humid environment.

Do not use the equipment in an explosive environment.

Take care of surfaces which should be clean and dry.

Connection with external equipment. Before connecting an external equipment (E.G.G., E.M.G. ...), contact SQLab company to check the compatibility.

Equipment specifications and use condition

Condition of use

Read technical specification. S.Q.Lab company will not be liable to any defect, failure or damage caused by improper use or improper or inadequate maintenance or care.

Power supply		
Mains	Tension	230/240 Vac nom.
	Frequency	47 - 400 Hz
Consumption		40 W
External Fuse	5x20 mm, 250V, T	0.5 A (⇔ 500mA)
Internal Fuses	5x20 mm, 250V, T	3.15 A

Input Signals	
« Aux. » terminal	+/-10 V
« Line in » terminal	+/-10 V
« EGG » terminal	+/- 10V
« Mouthpiece » terminal	+/-10 V

Output Signal	
« A » terminal	+/- 10V
« D » terminal	0 / + 5V
« Ext. » terminal	+/-10 V
« Mouthpiece » terminal	+/-15 V
« Line Out » terminal	+/- 10V
« Loudspeaker » terminal	+/- 25V (30W, 8Ω)
« Headphone » terminal	+/- 25V
« Aux. » terminal	+/- 15V until 50mA

Calibration
Calibration should be done every year.

Environment		
Temperature	Functioning	+10°C / +40°C
	Stopped	-20°C / +60 °C
Cooling		Air-cooled
Humidity		30 / 75 %
Pressure		700 / 1060 hPa

Mechanical Specifications		
« Interface » Dimensions	H	115 mm
	W	470 mm
	D	400 mm (440 with connectors plugged)
« Interface » weight		11 kg
« mouthpiece » Dimensions	H	290 mm (500 with sensors...)
	W	70 mm (130 with tubes...)
	D	70 mm (150 with sensors...)
« mouthpiece » weight		1 kg

Materials	
mask	silicone Rhodorsil RTV: • polydimethulsiloxanes • stable at normal temperature • decomposition temperature > 200 °C • local effect : can slightly irritates eyes • materials to avoid : strong oxidant
« mouthpiece »	Acetal copolymer (POM) C2521 (Hostaform) : • water absorption : 0.2% (23°C, 50 %humidity) • maximal temperature without damage : 140°C (few hours), 100°C (years) • dielectric rigidity : 35 kV/mm • resistant against chemical or organic agents • very low gas permeability • HB class for fire test UL94 • « alimentary » quality

Conformity of the equipment

EVA2 is in conformity for class 1 type BF equipment in respect of medical electrical equipment with regards to the standard EN 60 601-1.

Certifications and conformity	
Conformity	CE compliant Conformity for class 1 type BF equipment in respect of safety of medical electrical equipment with regards to the following standards : • EN 60 601 - 1 (1991) Conformity in respect of Electromagnetic Compatibility of medical electrical equipment with regards to the following standards : • EN 60 601 1-2 (1993) including : * EN 55 011 : emission requirements of ISM equipment * EN 61 000 4-5 : basic immunity standard for surge * CEI 801-2 : ESD immunity requirements for IPMC equipment * CEI 801-3 : Immunity to radio frequency Em-fields for ISM equipment * CEI 801-4 : Burst immunity requirements for IPMC equipment

Conventions

Symbols on the equipment

The following symbols may appear on the equipment:

earth protection

electrical ground

Typographic conventions

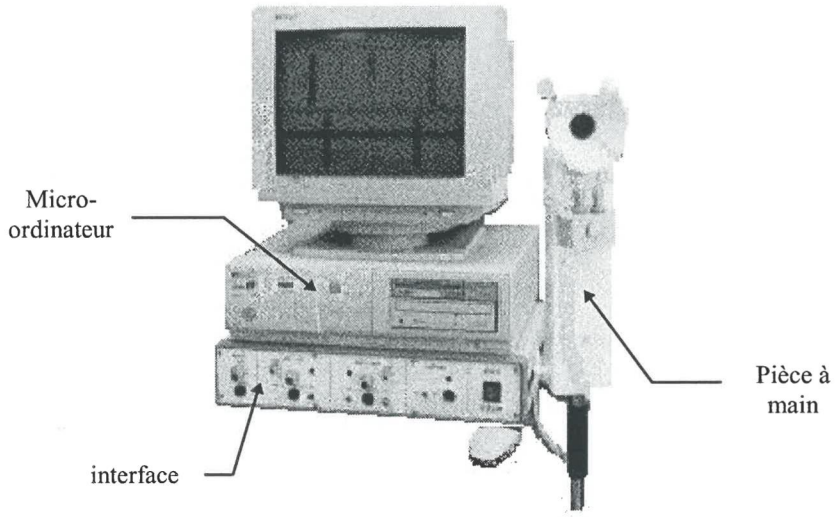
Some symbols may appear in margin in this manual

indicates conditions or processes which can damage the equipment or get you into a lot of trouble.

indicates conditions or processes that you must avoid for a correct use.

Installation

EVA™2 is made of several sensors, an electronic interface, an acquisition board and a computer. The « mouthpiece » is the part which contains aerodynamic sensors.



general view of the station EVA 2

To install the equipment, this is the way to proceed: (each step will be detailed)

Inventory

Check the inventory for a standard configuration:

- ☐ EVA2 interface
- ☐ calibrated microphone with cable
- ☐ tripod for microphone
- ☐ loudspeaker
- ☐ « cap» for external terminal
- ☐ acquisition board or module
- ☐ mains connection cable
- ☐ connection cable between the interface and the acquisition module
- ☐ dongle
- ☐ software
- ☐ manuals

Additional equipment for aerodynamic version :

- ☐ « mouthpiece »
- ☐ tripod for « mouthpiece »
- ☐ airflow mask set

How to place the unit

Choose an appropriate room to install the equipment. Be sure to check the power source and the environment carefully).

The room must not be noisy. For aerodynamic recording, take care of draught.

Do not expose the equipment to direct sunlight for a long time.

To avoid damages, do not subject the interface and the interior of the mouthpiece to vaporisation, liquids, solvents or excessive heat.

Place the interface on a plane surface near the computer. Screw the mouthpiece to the tripod. Check the fixing and the stability. Do not tilt too much the tripod.

Take care of « mouthpiece ». Transducers could be damage by an accidental fall.

Use the other tripod for the microphone. Screw the different parts. To avoid an accidental fall of the microphone, coil up the cable around the tripod. Take care of the stability.

Handle the microphone cautiously. It could be damage by an accidental fall.

Install drivers

Install software as an ADMINISTRATOR (Windows XP, Vista)
DATA TRANSLATION software is included in EVA CDROM or in OMNI CD CDRom.

THE SOFTWARE MUST BE INSTALLED BEFORE CONNECTING HARDWARE TO THE COMPUTER

Read the Getting Started Manual of DATA TRANSLATION.

Install hardware

Data acquisition board should be installed by qualified staff.
Read the getting started manual relative to the acquisition board

USB version (external module)
Plug USB cable from the external box to the PC.
Follow instructions on screen.

PCI Version (board inserted inside PC)

To set up the computer, perform the following steps:

- Turn off the computer.
- Unplug the computer and all peripherals.
- Remove the cover from you computer.
- Set up an expansion slot by selecting a 32-bit or 64-bit PCI expansion slot.
- Hold the board by its edges and do not touch any of the components on the board. Position the board so that the cable connectors are facing the rear of the computer.

To prevent electrostatic damage that can occur when handling electronic equipment, use a ground strap or similar device when performing this installation procedure.

- Secure the board in place at the rear panel of the system unit using the screw removed from the slot cover.

Do not force the board into place. Moving the board from side to side during installation may damage the bus connector. If you encounter resistance when inserting the board, remove the board and try again.

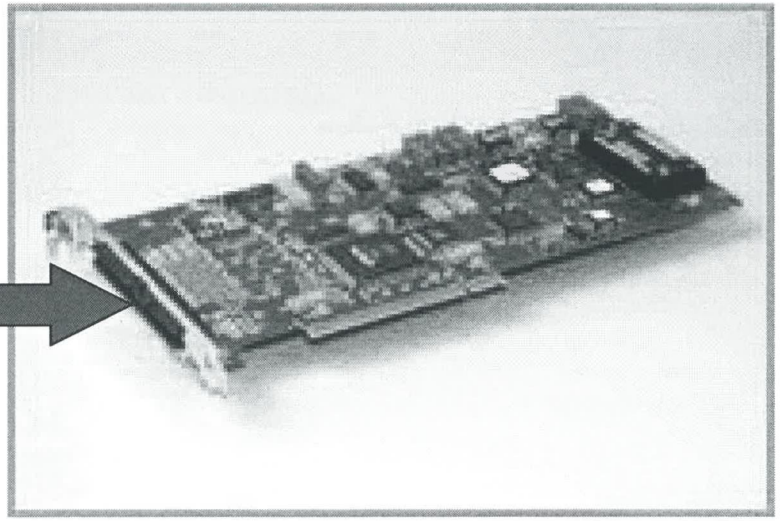
- Power up the computer.

Connexion between EVA2 and computer (version PCI)

Ignore in USB version.

This connector is FRAGILE.

Handle with care



Make permanents connections

Make permanent connections to each component in the system (rear panel of the interface).

⚠ The equipment must be switched off to connect the different cables.

(a) Mains connection cable

Use only the mains connection cable provided with the equipment.

(b) Connection with the computer

USB Version

Connect the two cable of the external USB module to the rear face.

PCI Version

⚠ **HANDLE WITH CARE**

Use only the cable provided with the equipment. Connect it between the interface and the acquisition board (in the computer). The cable should not be too stretched. Screw the connections fixing.

(c) « Mouthpiece » terminal

Plug the mouthpiece cable cautiously. Screw the fixing.

(d) Loudspeaker terminal

Connect the loudspeaker to its terminal (« Loudspeaker Left »). You can connect an other one on the second terminal (« Loudspeaker Left ») if necessary (40W, 8Ω). The loudspeaker is automatically switched off if a headphone is connected (front panel).

(e) External equipment terminal

Normally, the « EXTernal » connection is not used. Screw the « cap » on the EXT terminal.

(f) Ground

Non available in Propac version

(g) fuse

(h) tension selector

Never change its position

(i) Ventilation

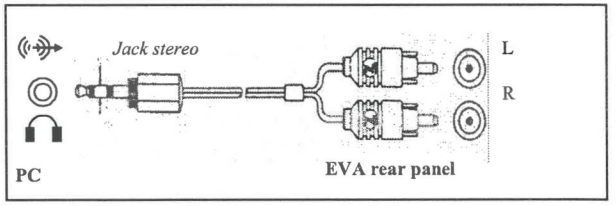
EVA2 equipment is cooled by air ventilation. The fan must works normally. Be careful that materials do not obstruct the ventilation holes.

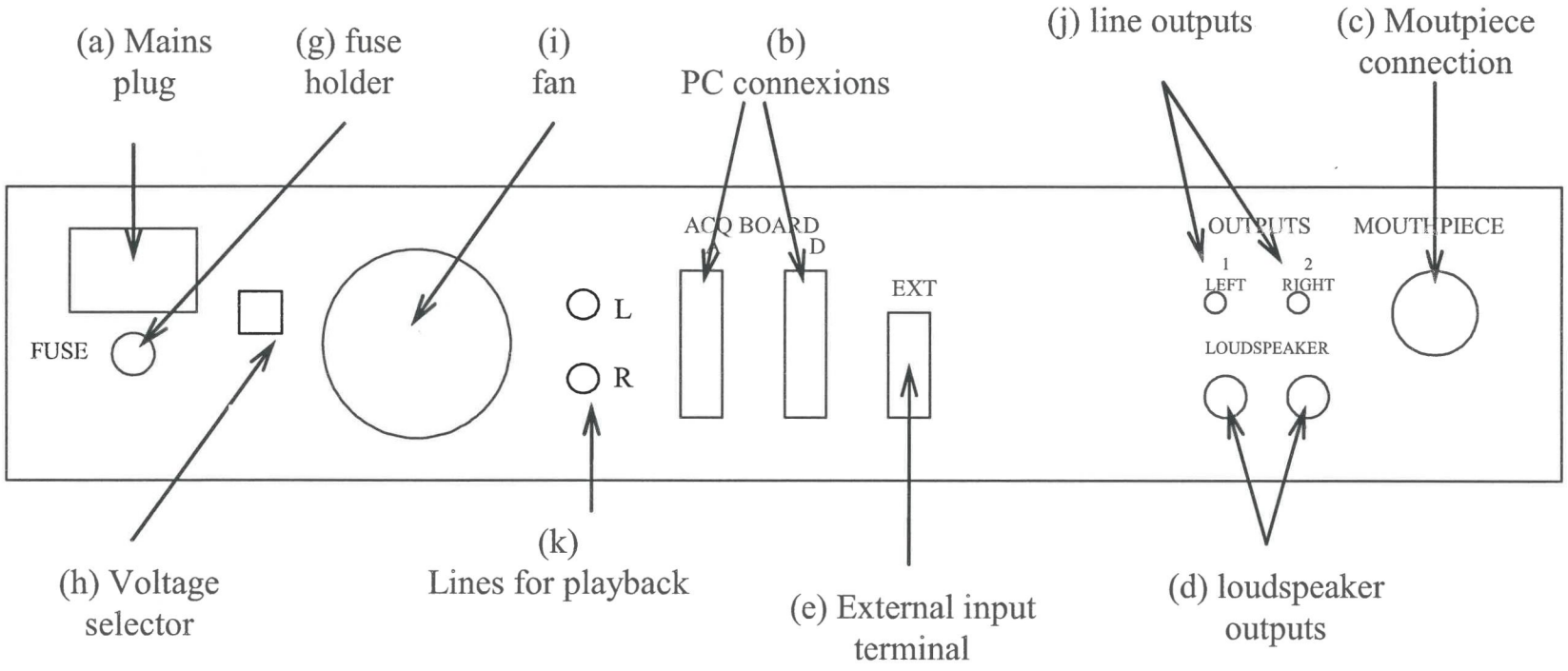
(j) line outputs

For connection to an audio tape recorder or DAT

(k) Sound lines for playback (USB Version Only)

To connect to the output of PC sound board. These lines are amplified and are playback by EVA device.





Rear panel of the interface

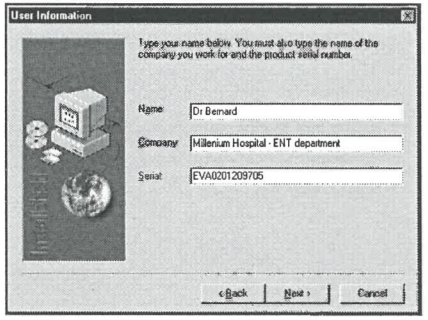
Install the EVA 2 workstation software

The software environment of the EVA workstation is named SESANE (Software Environment for Speech ANalysis and Evaluation). It installs itself automatically on the hard disk. To do so :

a) Insert the CDROM. Installation is launched automatically

b) If the autorun does not start, use the file manager, open the CDrom volume and execute sesClean.exe

c) Follow the instructions, until you get a dialog box requesting for information about the owner.



- Name : facultative.
- Company : Obligatory. It is recommended to enter the hospital name or the organisation name.

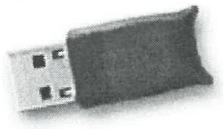
Important : the text entered in this field will appear at the bottom of the documents printed by the software.

- Serial : enter the serial number of the system.

e) click **Next** and follow instructions.

Install protection key

Plug the protection key (blue) on a USB port and follow instructions.



First test

Use the following instructions to test the equipment :

1. Switch on
2. Check that the light of the power button is on
3. Connect the microphone on the « MICRO » terminal (« INPUT1 »)
4. Turn the input selector on « MICRO » position
5. Turn the volume button in a middle position
6. Speak
7. Check that the control light is on
8. Follow step 3 to 7 for « INPUT 2 »

Cleaning and general maintenance

General cleaning

Avoid places in direct sunlight or in other places where the temperature is high.

⚠ Do not expose the interface to vaporization, liquids, solvents...

How to clean masks and tubes

After use, clean and disinfect mask and tubes

- Mask and nasal nozzles are made in silicone Rhodorsil. They can be washed by cleaning and disinfecting agents **at normal temperature** and pressure. Use cleaning agents as Bactinyl, Sydex, Stéranios...
- The choice and use of catheter for pressure measurement is on the responsibility of qualified user.

How to clean removable parts of the « mouthpiece »

1) Remove masks and tubes
2) Unscrew the airflow ducts
    a) to remove the oral airflow duct, loosen the screw and pull it up.
    b) to remove the nasal airflow duct, loosen the screw and pull it.
3) Plunge the ducts into a cool solution with bactericidal, fungicidal and viricidal agents.
4) Rinse, shake and let them dry. Be sure that there is no more water into the little tubes. To speed up this operation, you can use an hair-dryer.
5) Usually, it is better to clean the ducts every evening and let them dry all night long.

⚠ **Do not put the ducts on the mouthpiece if they are not dry enough (water could damage sensors)**

⚠ **Do not unscrew grids. This process could disturb the calibration.**

How to clean the « mouthpiece » and the interface

To clean this unit, use a soft, dry cloth. For very dirty surfaces, dip a soft cloth in a weak soap-and-water solution or weak detergent solution and wring well. After cleaning, wipe with a soft, dry cloth.

Troubleshooting guide

Before calling qualified staff to repair this equipment, consult these procedures to know if the problem can be solved by yourself. A simple verification or a minor setting can be sufficient for repairing. If no solution has been found, call your after sale service.

Interface

Problem	Probable cause	Resolution
The ON/OFF switch does not light on	Mains cable is not well plugged.	Ensure the mains cable is plugged
	a fuse blew	change the fuse (see after)
Interface runs correctly, but the vu-meters at screen are not functioning.	the cable between the interface and the PC is not correctly plugged..	verify the cable connection.

Audio

Problem	Probable cause	Resolution
While recording with the on stand microphone, the control indicator remains lighted off	the microphone cable is not in place.	Ensure the cable is plugged
	the input selector is not on the good position.	Turn the input selector on « MICRO » position
	Input volume is too low.	Increase the input volume
While recording with the mouthpiece microphone the control indicator remains lighted off	the mouthpiece cable is not in place.	Ensure the cable is plugged
	the input selector is not on the good position.	Turn the input selector on « MASK » position
	Input volume is too low.	Increase the input volume
While recording with a tape recorder, a DAT, or a CD, the control indicator remains lighted off	the external equipment cable is not in place.	Ensure the cable is plugged
	the cable is plugged in an input of the external equipment	Plug the cable in an output.
	the input selector is not on the good position	Turn the input selector on « LINE » position
	Input volume is too low.	Increase the input volume.
Sound is distorted	Input volume is too loud.	Decrease the input volume.
When using audio playback in software, nothing happens	Loudspeaker connection is incomplete or incorrect.	Ensure connection is correct
	Audio output level is too low.	Increase the output volume.
	A headphone is plugged on the front panel..	Unplug the headphone.

EGG

Problems with the portable Laryngograph

Problem	Cause	Action
You cannot- get any EGG signal.	The Laryngograph is not switched on.	Turn the selector on ON
	Battery is discharged	Charge it
	Level is too low	Increase the input level
	Electrodes cable is not connected.	Ensure the cable is in its socket
	Electrodes are not well placed.	Place the electrodes on either sides of the larynx

Problem in relation with the EVA equipment

Problem	Cause	Action
While recording with the EGG, the control indicator remains lighted off	the input selector is not on the good position	Turn the selector INPUT2 - RIGHT on « EGG »
	Input volume is too low	Increase the input level
	External Cap is not plugged	Screw the « cap » on the EXT terminal (cf. p.9)

Aerodynamic

Problem	Cause	Action
While recording aerodynamic parameters, the vu-meters at screen are not functioning.	the mouthpiece cable is not in place	Ensure the mouthpiece cable is plugged
	Masks or probes are not well placed.	Ensure that the masks and probes are placed with no leakage.
Records have a big shift.	Electronic sensors have an offset	click on the calibration icon before recording.

Fuse Replacement

⚠ **Before repairing, switch off the equipment. Repairing must be done by qualified staff.**

Replacement of general fuse

Diagnosis :

Replace the general fuse if the power switch is on but the light is off (Confirm that the power cord plug is connected completely)

How to do ?

1) Disconnect the mains power cable.
2) Unscrew the fuse holder with a tool
3) Remove the fuse.
4) Place a new fuse.

⚠ Use same type.

4) Screw the fuse-holder
5) Connect the mains cable.
6) Test.
7) If fuse blew again, contact your dealer.

Replacement of power supply fuses

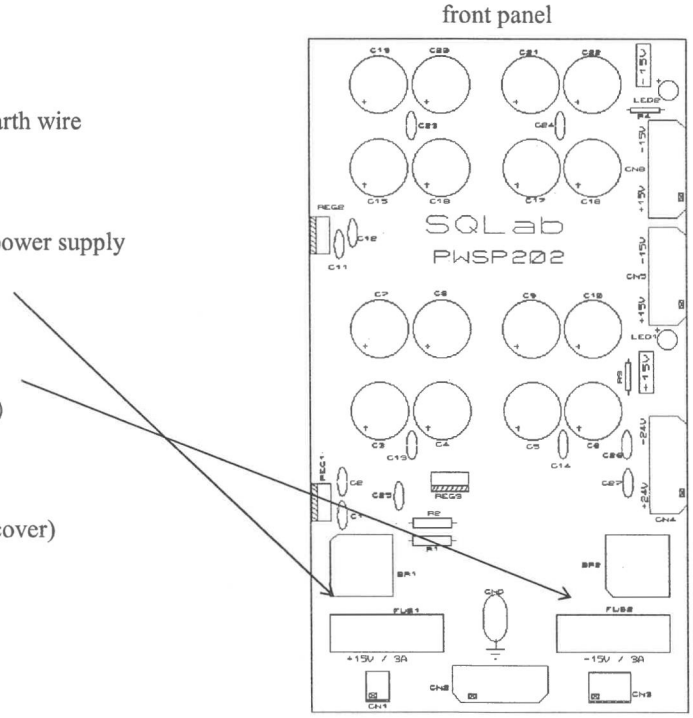
Diagnosis :

Check power supply fuses if the power switch is on, its light is on, everything is correctly connected but the equipment does not work correctly.

Procedure :

1) Remove the cover (take care about the earth wire connected to this cover)
2) Look for the power supply
3) Switch on the equipment. Check on the power supply if red and green lights are on.
4) If red light is off, replace FUS1 (+15V).
5) If green light is off, replace FUS2 (-15V)
6) Put the cover back

   (check if earth wire is connected to this cover)
7) Test
8) If fuse blew again, contact your dealer.



Equipment storage and transport

Equipment storage

If the equipment is not used for a long time, protect it, especially the mouthpiece.

Avoid places such as the following :
In direct sunlight or in other places where the temperature is high.
In places where there is excessive vibration or humidity.

Such conditions might damage component parts and thereby shorten the unit's service life.

Equipment transport

If you need to send the equipment by road, railroad, or flight..., pack it up very seriously to avoid damages, especially the « mouthpiece ».

Menus and keyboard Accelerators

eva

Menu	Keyboard Accelerator	Toolbar	Action
File | New	Ctrl N		Create a new document
File | Open	Ctrl O		Open an existing document
File | Save	Ctrl S		Save the active document
File | Information	Ctrl I		Patient information
File | Start Recorder	R		Start real time recorder
File | Playback	P		Start or stop playback
File | Print	Ctrl P		Print the active document
Edit | Copy	Ctrl C		Copy the selected graph or array and put it in the clipboard
View | Zoom out	-		More general View (horizontal axis)
View | Zoom in	+		More precise View (horizontal axis)
View | Full Page	*		Full page view (horizontal axis)
View | Move Left	←		Move the view to the left
View | Move Right	→		Move the view to the right
View | Scale out	Ctrl -		More general View (vertical axis)
View | Scale in	Ctrl +		More precise View (vertical axis)
View | Full Scale	Ctrl *		Automatic vertical scale
View | Move Up	↑		Move up the selected graph
View | Move down	↓		Move down the selected graph
Action | Measures	M		Call or hide the measure cursor
Tools | Options	O		Software options